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An Awkward Situation

THE overlapping of the National Electrical Convention with the last week of the British Industries Fair, of which brief mention was made in a leaderette on page 632 of our last issue, is beyond all question a matter for extreme regret. Those who are not behind the scenes may well wonder how anybody who appreciated the importance of the two events could consider such an arrangement as serving the best interests of the electrical industry.

By a coincidence which might well have been turned to good account by the choice of suitable dates, 1935 was chosen for the important Fair experiment of holding the Birmingham Section in May, so as to catch foreign buyers in larger numbers; and it was some months ago selected as the year in which the long-desired National Electrical Convention should take the place—also as an experiment—of the several separate electrical gatherings in the early summer.

Two separate special events with a suitable interval between them would have maintained a popular electrical interest over a considerable period. Or if the Convention and the Fair could have been held simultaneously at the same place, we could have concentrated all our forces upon securing for the industry its biggest propaganda success.

If, however, the alteration of date and venue mentioned last week have to stand, those who are well qualified to assist both movements and are keenly interested in them will have their thoughts and plans divided up between Bournemouth and Birmingham for the most important week of the Fair.

It has become the practice of many of the leading manufacturers of domestic and industrial electrical products to exhibit of their best and latest at the Fair in February and at the I.M.E.A. Convention in May. This time they will require to have their best men and their best exhibits at two places at once. In our view this is something that they need not, and should not, have been asked to do.

For some years past the programme of the Electrical Section of the Fair has included set visits of members of various electrical institutions and associations. Is it likely that many electrical men will be able to leave their posts and attend at both Birmingham and Bournemouth within so short a period?

Mr. E. J. Jennings, who has championed the cause of the Convention for many years, and has also been most actively associated with the Birmingham Fair, is emphatically of opinion that at all costs a clashing of the two events should be avoided. Efficiently organised they would make electrical history. Both events are national events, and call for complete concentration, not dissipation, of our energies.

Six months have still to elapse before the Fair opens. Arrangements for it are in an advanced state, and it is unlikely that either the authorities in charge, or the non-electrical sections, will agree to a change of date just because we are holding an electrical convention. The only hope of preventing the deplorable overlapping lies in altering the Convention date again.

The best interests of the whole electrical industry would be served by doing this, but it is whispered that there are insuperable difficulties, and if it should prove to be absolutely impossible, new plans should be made to ensure that the whole electrical industry may reap the maximum advantage from an awkward situation.

The National Electrical Convention, though "organised by and under the auspices of the I.M.E.A.," states on its official paper that it incorporates five different associations; presumably it has a committee on which representatives of these organisations sit. The Fair also has an electrical committee, somewhat similarly constituted we believe.

What could be better than for these two committees to act in complete co-operation, so that each may derive full advantage from what may really be a joint effort for the good of everybody electrical? All the Associations have experienced secretaries; why not evolve a strong combined secretariat from among them? It will be a busy time for everybody.

A Manchester Example

THERE is much talk of compulsory wiring rules to secure satisfactory installation work, and maybe they are necessary. If, however, compulsion can be avoided a better understanding will exist between electricity supply authorities and electrical contractors, and we are glad to record in this issue a meeting convened by the Manchester Electricity Department to discuss the question of good workmanship. At this meeting the chief electrical installation engineer of the Department (Mr. L. H. Marlor) addressed contractors on the subject of safety first in relation to electrical installations, and the contractors put forward their views. One matter stressed was the sale of unsafe appliances at low prices by (presumably) non-electrical shops. Mr. Marlor recalled that Manchester once had a testing department for apparatus, but the amount of work involved rendered its continuance impossible. It was thought that there should be a national establishment for the purpose—not the first time such a thing has been suggested. Something of the kind seems to be very necessary, for the benefits of safe installations can be entirely cancelled out by unreliable apparatus, for which the contractors cannot be held responsible.

Work Without Drudgery

THE replicas of actual workmen's flats at the exhibition of the Electrical Association for Women provide a most practical demonstration of what can be, and is being, done to electrify small property. In spite of the wide variations in the rent of these flats for no great difference in dimensions, and of the diversity in tariffs, the amount that the tenants are willing to pay for electricity seems to be about £10 per annum, plus hire charges. The equipment impressed us as making all the difference between the dignity of the title "working woman" and that of "household drudge." Two of the flats, we noticed, had small hand pumps to lift the hot water from the wash-boiler into the adjoining bathroom. This is certainly a better way than carrying the water in jugs, but is it the best that can be done?

Water and Coal

THE production of electricity from water power for general distribution (as distinct from its local use for aluminium reduction and other processes which cannot afford to bear transmission charges) owes its possibilities largely to the flexibility of the grid system, as was pointed out in the discussion on the I.E.E. paper of Messrs. A. S. Valentine and E. Bergstrom. The potential water power in the United Kingdom is only about 300,000 kW—appreciably less than the capacity of Barking station and under 5 per cent. of the kW installed in all authorised undertakings—so hydro-electricity is not likely to prove a formidable rival to coal. At one time the general attitude towards coal appeared merely to be a desire to conserve our resources. The more modern idea that we should seek new methods of exploiting them was illustrated at the Institute of Fuel dinner on Monday in references to the result of research in the hydrogenation of coal.

Electrical Shop Windows

WINDOW-DRESSING should be a subject of special interest to our trade readers just now. Apart altogether from the fact that the Christmas season is very near at hand, this is the time of year when much purchasing is done by the general public. The article by Mr. W. Jervis on "Window Dressing to Attract Business," appearing on page 687 of this issue, is therefore quite topical and will, we think, be found to contain many suggestions which electrical shopkeepers and showroom managers should consider worthy of attention. There is, beyond any doubt, plenty of scope for originality in this branch of electrical activity, and not all the brilliant ideas are the product of deliberately sitting down to think them out in bulk. Many a journalist will express agreement with Mr. Jervis when he refers to the value in the aggregate of many little casual thoughts and ideas which are "taken note of" when they occur to one, with a view to their being brought together ultimately should occasion arise. The electrical window-dresser can learn much from other people's windows. Most of us are familiar with the confusion of mind that is occasioned by looking at a mass of products. How often we pass on without buying anything, particularly if there is a noisy loud-speaker or gramophone worrying one amid the glare of lights placed anywhere and anyhow. We hope that the points brought out in the article referred to will be found useful in themselves, but we believe that their expression will also serve to stimulate other original ideas and raise the general standard of electrical shop-window dressing.

Japan's Supply Problem

JAPAN'S recent misfortune through typhoon and flood has raised some interesting questions relative to that country's electricity supply system. Industrial concerns have recently been discouraged by the authorities from installing their own power-houses because of the Government plans to reorganise the supply industry and to establish a grid system as far as possible throughout the country. Now, however, there is a call for decentralisation of power generation, multiplication of transmission lines and, in particular, the safeguarding of supplies of electricity for waterworks and pumping purposes. At the same time it is evident that a check has been given to the advance of the network in West Japan to the eastern part of the country, at any rate for the time being. Meanwhile the Cotton Spinners' Association is reported to be seeking official sanction to the erection of works power plants. The Department of Communications has already granted permission to two important industrial concerns to install 4,000-kW plants.

American Electrical Industry

IF we may judge from the opinions expressed in a leading New York electrical contemporary, recent events in the States have brought greater hope and inspiration to the electrical industry than have characterised it since the "crash." The National Electrical Manufacturers' Association and the National Electrical Wholesalers' Association held conventions at Chicago and Detroit respectively at the end of October, and business was reported to be improving materially. The new tone, it is said, synchronised with the change in national sentiment resulting from indications that the Administration was adopting a more conservative attitude encouraging to business. President Jones, of N.E.M.A., is quoted as being convinced that N.R.A. was being revised to allow industry more voice in policing itself, giving it more and better self-government, but independently of that fact electrical trading was found to be already picking up. The *Electrical World* quotes retiring President Tritle of the N.E.M.A. as saying that when the code was submitted in 1933 only about four companies were making any money. Conditions have now been practically reversed showing that due "either to the Association's work or to the value of the code" the electrical manufacturing industry has changed from one practically bankrupt to a sound financial structure.

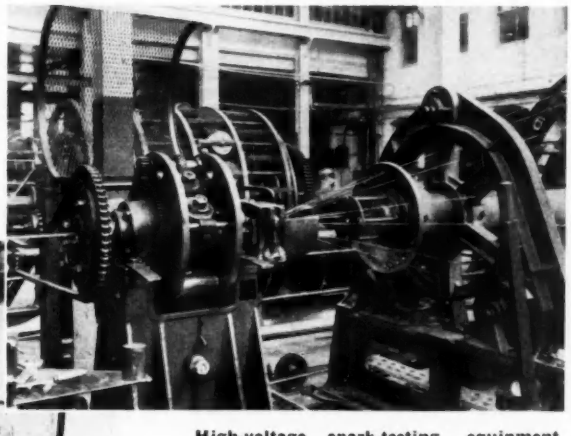
Dr. Gaby's New Appointment

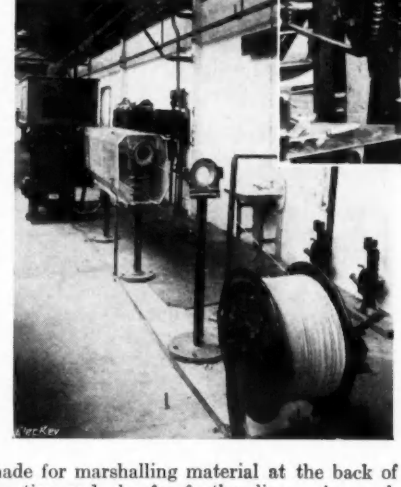
THREE months ago in a leaderette entitled "Political Victims" (ELECTRICAL REVIEW, Aug. 17th, p. 204), we quoted transatlantic criticism of the action of the new Ontario Hydro-Electric Power Commission in summarily dismissing without public explanation Dr. F. A. Gaby, who had been twenty-two years chief engineer of this great electrical undertaking. Engineers in this country who have met Dr. Gaby, either on his visits to England or amidst his hydro-electric surroundings in Canada, will be pleased to learn that he has lately been appointed assistant to the President of the Canadian Pacific Railway Co.

A Manchester Cable Factory

DURING the past year the cable factory of Messrs. W. T. Glover & Co., Ltd., at Trafford Park, Manchester, has been completely reorganised according to a plan which, at the outset, envisaged the new works as an organic whole. Before any reconstruction was begun a complete scale model was prepared to represent in actual form the ideal aimed at, and though some modifications were naturally called for by practical considerations, the scheme as finally adopted embodies essentially the company's experience of what are the requisites for a modern cable factory. The plans, while allowing for the utilisation of such existing plant, as was suitable, with or without modifications, for their purposes, provided for the purchase of some new plant and considerable extensions to the buildings which necessitated the acquisition of additional land.

We recently had an opportunity of visiting the factory and found the broad result to be a planned co-ordination of manufacturing processes under one roof, permitting the production of cables in one line, in proper sequence from stranding to armouring and serving. There was plenty of "elbow room," for in addition to wide gangways lengthwise and crosswise between the lines and sections and the machines, a good allowance of space had been made for marshalling material at the back of each machine or section and also for further lines. As much space has been given to the flow of materials as that taken up by the machines.





High-voltage spark-testing equipment for rubber cable (left) and pre-spiralling gear on a stranding machine

The Extended Main Shop

The addition of two bays, 300 ft. long and 180 ft. wide, at the west end of the main shop had resulted in one room measuring roughly 650 ft. long and 240 ft. wide. Armouring and serving machines and storage space for cable for shipment were situated within the building on the Trafford Road side adjoining the railway siding. An additional bay measuring about 240 ft. long and 80 ft. wide was also included in the extension, and this has been equipped for testing h.v. cables up to 300 kV.

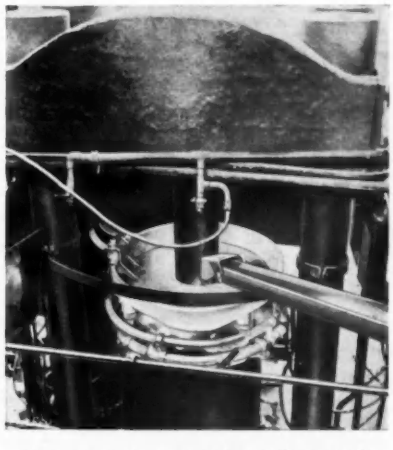
Walking from end to end of the shop, we passed in sequence the stranding machines, the paper-insulating machines, the lead presses, the test bay and the armouring equipment, materials being introduced at the cross gangways at the appropriate points.

A complete absence of overhead or wall cable runs, steam lines and fume pipes was noticeable, and we were reminded of a modern generating station by the way these were all neatly stored away in culverts below the floor arranged criss-cross with the gangways. We were also impressed by the absence of the impregnation tanks usually associated with a cable works; this, however, was as in the past, for the company adopts the plan of pre-impregnating its insulating paper.

The revised lay-out, we learned, had resulted in a 20 per cent. increase in production from the same machines, and this had been largely brought about by the rearrangement of individual machines to carry out various alternative operations on one drive in tandem. For instance, to the armouring machines jute heads and compound pans had been added.

One of the most interesting developments in cable-making is the pre-spiral shaped conductor. In the pre-spiralling head the "clover-leaf" or segmental conductor is actually built up in that form, and the necessary "twist" to permit cable flexibility is given to the copper so that when laying them up they fit into one another and remain in position without having to be "sprung." This eliminates the possibility of kinking or "dog legging" during installation. In the insulating section a sufficient number of core-insulating machines have been provided to feed the laying up and belt-insulating machines.

Following the processes of manufacture in correct order, we came to the lead-covering section, where we were privileged to see what Mr. Beaver had already referred to in our pages, namely, the Glover patented lead press. This was designed to eliminate (or make perfect) the welds between the charge of molten metal in the press and achieves its object by preventing oxidation at the surfaces between the charges by eliminating all air from the press container. A conical tray at the top of the press and around the ram is automaticaly kept partially filled with the molten metal in actual contact with the ram so that the only possible air entrance to the container is continuously and effectively sealed. The testing sec-



Air sealing arrangements at the top of a special lead press

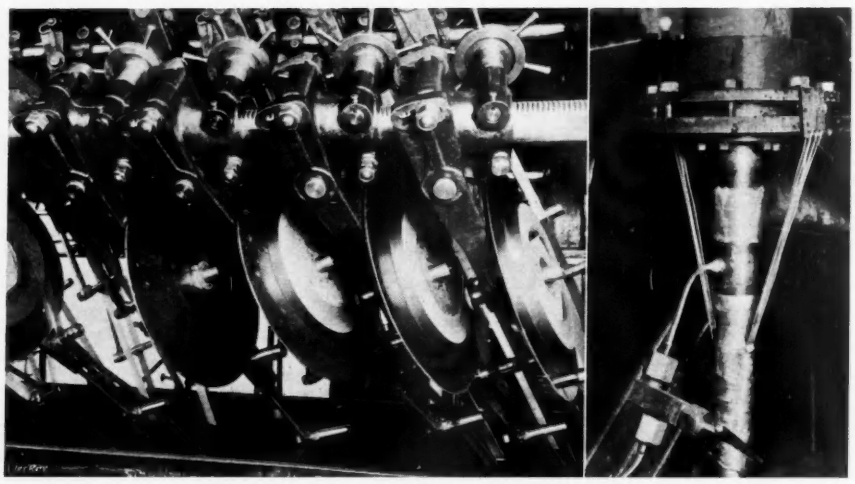
tion was an indication of advance in ordinary cable manufacture. We saw a great many drums of cable under test with the conductors temporarily connected, but few of them were immersed in water, the present day demand being in the direction of compounding at the lead press and eliminating "tanking."

The pre-impregnation of the insulating paper is carried out separately from the main factory. We saw two types of impregnators, one for h.v. cables, in which the impregnation was in vacuum, and one in which the process was effected in air. The paper passed over drying rollers, through the compound and over a surfacing roller at the top (applying a "lubricating" layer of compound on one side of the paper only) to the final roll at the bottom, where a convenient area of the moving paper was presented for inspection. Glover's base their claim in respect of non-draining cables on this special pre-impregnation of the paper, the method permitting the use of a more viscous compound. The two methods, commonly called "prior" and "macs" impregnating respectively, demand or permit different impregnating compounds. At one end of the impregnation shop was the only general type of impregnation tank in the factory, and this was used for dealing with cable padding.

Up to and including lead covering, h.v. cable is made in a separate self-contained building, in which we saw for the first time conductors insulated under oil from impregnated paper spools which were stationary in relation to the conductor on which they were lapped, this method being claimed to be much more accurate. The conductor revolved as it passed through the trough of compound at the bottom carrying the papers with it. The compound, which sealed the conductor from air, was circulated and filtered continuously during operation. After lead covering the cables go to the main shop, subsequent processes in both departments being common. For pressures above 33 kV the company's latest development, the gasfilled cable, which Mr. Beaver described in our issue of June 16th, 1933, is available. We saw lengths of this type of cable designed for 66-kV working with conductors of 0.2 sq. in. section undergoing the severe test of a daily heating cycle up to 100 deg. C., and at a gas pressure of 350 lb. per sq. in. We also saw a specimen of 132-kV gas-filled cable undergoing a test of a similar character.

Apart from the essential feature of this type of cable, namely, the presence of nitrogen, its manufacture, we learned, was little different from that of the other h.v. cables produced, except that there was no compound applied in any way between the impregnated paper layers. The core, solid dyed to remove in part the interstices between the outside strands, was covered with two layers of metallised paper before being lapped with impregnated paper.

Over the insulation was applied a copper earthing sheath and then the inner lead sheath, over which brass tape was wound for protection against expansion before the outer lead sheath and protection were applied. Gas filling was not effected in the factory but on site after installation. A gland plumbed in the lead sheath provided a suitable connection, *via* a valve, to the nitrogen cylinder, the gas being applied at 200 lb. per sq. in., and the air in the cable was either flooded out of the cable by means of the gas pressure or it was pump evacuated.



Paper strip entering an oil trough for reception by the revolving conductor (left) and the gas cylinder machine at the end of a 132-kV cable on test in the research laboratory

In addition to high-speed stranders, forcing insulating machines, longitudinal rubber-covering machines and high-speed vertical lapping machines usually associated with the modern rubber cable factory, we saw the latest development for testing rubber insulated cables. The procedure was that cable was passed at high speed through a tube in which there were many loose chains around and in contact with the insulation, while a potential of 8,000 to 15,000 V, depending on the thickness of insulation, was maintained between the conductor and the surfaces around the insulation.

In the event of a discharge taking place through a fault in the insulation, the circuit would be automatically tripped and an elaborate system of braking would "pull up" the fast moving cable almost immediately. Thus any fault was easily traced and marked for repair.

An attempt to describe the factory fully would demand references to many of the other fine examples of equipment we saw, for instance, the high-speed and continuously operated automatic wire-drawing machines, but our object has been to indicate the modernisation of the works generally.

Electricity Supply in Madras

THE report for 1933-34 of Mr. H. G. Howard, chief engineer for electricity, Government of Madras, refers to the opening on April 5th of the Pykara hydro-electric scheme which has been constructed at a cost of Rs.109.88 lakhs; the estimate was Rs.133.36 lakhs. During the twelve months nearly eleven million kWh was generated at the power house, instead of under seven million allowed for in the original report; about 83 per cent. of the output was used in the Coimbatore district, in which a supply had been started a few months earlier (October, 1932).

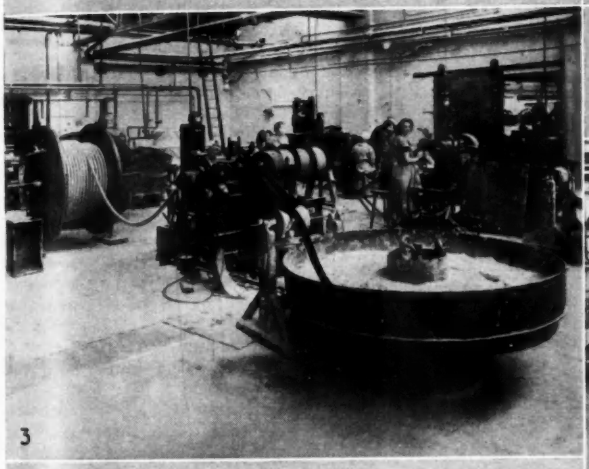
Owing to the severe effects of lightning, two 1,000-kVA transformers have been ordered as buffers between the local 11-kV lines and the station bus-bars. The Periyar scheme has been shelved in favour of the greater possibilities offered by the Mettur hydro-electric scheme, which is estimated to cost Rs.182 lakhs; a report on this scheme was submitted to the Government in June last.

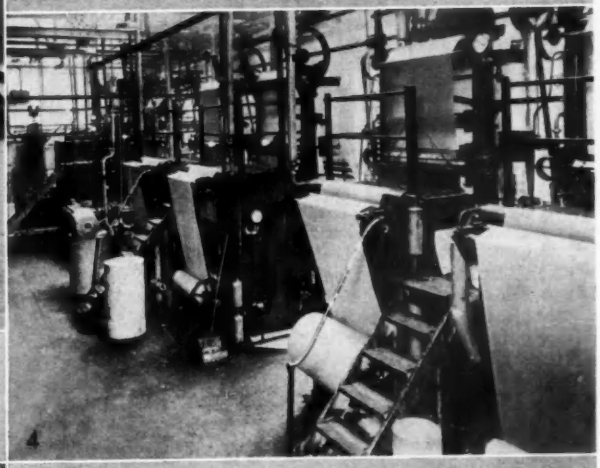
Two oil-engine stations, using sets displaced from the hydro-electric area, were brought into service early this year for building up loads to be supplied at a later date from hydro-electric sources. A third (Palni) is expected to be ready by next Christmas for supplying a municipal distribution scheme laid down by the Crompton Engineering Co. At each of the first two stations (Dindigul and Virurdunagar) the generator plant consists of two 350-h.p. Crossley engines coupled to 190-kVA 440-V three-phase G.E.C. alternators. Other schemes are pending with oil engines displaced by electric motors.

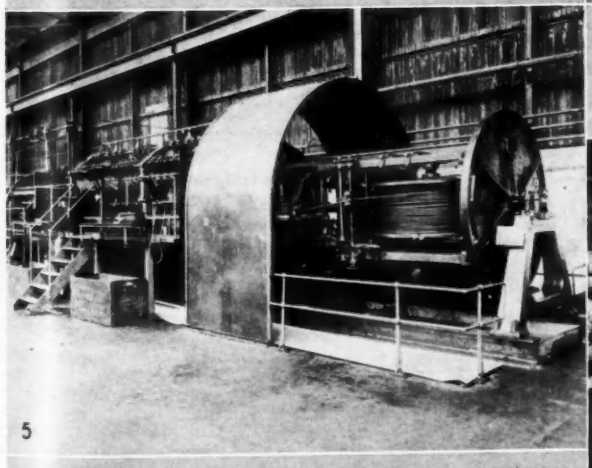
Municipal electrification schemes in the hydro-electric areas are all managed in the initial stage by the Government. Forty-five towns in the Presidency have distribution networks (twenty-three municipal), an increase of twenty-seven in the first five years. The total generating plant of all undertakings in the Presidency is 61,700 kW, of which the Madras Electric Supply Corporation station accounts for 40,000 kVA and the Government hydro-electric station at Singara for 23,400 kVA.

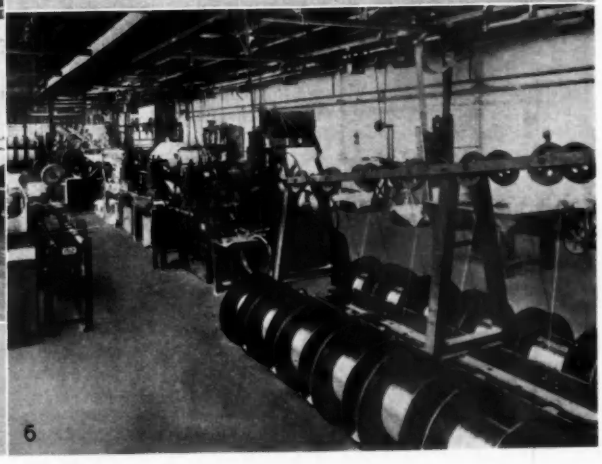
The Government also advances money to old or new mills for the purchase of electrical machinery. Nine mills, with an aggregate installed capacity of nearly 5,000 h.p., were connected during the year, bringing the total mill load to 4,700 h.p. It is expected that the connected power load will reach 10,000 h.p. before next April, but the number of house services is not increasing so rapidly due partly to trade depression and partly to understaffing. Extensions are regarded as remunerative if the estimated revenue for the first eight years covers the capital cost.

The report concludes with a recommendation for the formation of a public corporation to control electrical matters in Madras, in view of the unsuitability of the present Government system of administration to the needs of commercial development.









Cable-making in a Modern Factory at Trafford Park. **(See preceding pages)**

1. The lead press section, showing two Glover patent presses in the foreground. 2. A large tandem wire-armouring and jute-serving machine. 3. Four-core screened trailing cable being covered in a rubber-forcing machine. 4. The paper pre-impregnation shop. 5. A papering machine with stationary spools for h.v. cable. 6. A twenty-four conductor, three-layer longitudinal rubber-covering machine

Changing the Voltage. By L. C. Fowler

Details of cost and other factors

RECENT statistics show that over three hundred undertakings throughout Great Britain have now conformed to the standard voltage of the Electricity Commissioners, but there are still a number of supply areas in which it is a pre-requisite for future expansion that a change-over to 230 V should be undertaken without delay. To entertain the idea of developing a domestic cooking and water heating load where the voltage is 110 is ludicrous for all the most subtle national and local advertising campaigns are bound to be unavailing.

To arrive at a fairly reliable estimate of cost for the whole scheme is by no means simple. In all areas of supply diversities in cost are found. Some portions of an area necessitate only a change of lamps with perhaps an occasional electric iron, while other sections of a more developed residential nature reveal a profusion of electrical apparatus, and here the cost is high. Another class of consumer with high change-over costs is the shop-keeper and/or the small individual manufacturer. The number of specialised machines with integral electric motors is the chief item of expenditure when dealing with this type of consumer. Large power consumers do not present any financial problem as they usually receive a high-voltage supply and transform down to their special requirements.

Mr. L. C. Fowler

By Loan or From Revenue?

When all the varying factors contributing to the total cost of the scheme have been considered, an average figure can be roughly taken for each individual consumer. On matters relating to generation and distribution there is no dearth of official figures which are of great assistance when estimates are being prepared; but there are no tabulated figures of change-over costs to help us. Statistics compiled by several supply undertakings which operate in fairly representative areas suggest that the figure may be estimated at about £5 per consumer, to include not only the actual cost of changing consumers' apparatus, but also overhead charges such as wages and supervision.

To change over, say, twenty thousand consumers at £5 per head entails an expenditure of at least £200,000 within about five years, with little hope of any comparable increase in revenue. The orthodox method of financing expenditure of this nature is by loan. This requires annual payments of principal and interest over the following number of years:—mains and services, 25; plant (sub-station and equipment), 20; meters, 10; consumers' apparatus, 7.

Despite all the advantages, however, that can be deduced in favour of a long term loan, the supply authority should seriously consider whether it cannot finance the conversion scheme entirely from revenue. The policy pursued by some municipal authorities of reducing tariffs whenever a surplus is available is not always sound, although politically it may be good window-dressing for party propaganda. If the existing tariffs are sufficiently attractive there is no valid reason why surplus revenue should not be earmarked for change of voltage.

Legal Obligations

Strictly speaking, the legal obligation to change consumers' apparatus free of charge can be confined to the apparatus of which the supply authority has cognisance. Unauthorised connections to the supply mains need not be converted except at the consumer's expense, but to enforce the strict letter of the law would not conduce to the success of the scheme. Litigation should be avoided wherever possible, and it will be found advisable to change over consumers' apparatus whether connected with the approval of the authority or not.

The change-over must be planned well in advance despite the set-backs that will inevitably be experienced, calling for the replanning of portions of the work. The distribution system may present difficulties, especially where a closed network is in use. In most cases, however, the network will be large and interconnected and can be split up into small sections.

The first stage in the change-over is to inform each consumer that an inspector will call to take an inventory of the lamps and appliances. The compilation of reliable inventories is the next task to be undertaken. The success of the change-over will depend largely upon the accuracy of this data. Much can be done by the use of loose-leaf inventory sheets punched for fixing in strong metal binders. The reverse side of the inventory slip can be conveniently used as a receipt for the converted apparatus.

When the inventories have been completed, the information should be transferred to permanent record cards, by the intelligent use of which each stage of the work can be kept under close supervision.

A Publicity Campaign

The idea of running a publicity campaign alongside the change-over scheme should be seriously considered, as so splendid an opportunity of interesting consumers in new electrical appliances should not be allowed to pass.

There is little doubt that consumers do not look upon a conversion scheme as an altruistic gesture on the part of the supply authority. To minimise any feeling of unfriendliness or suspicion it is wise to acquaint consumers of the financial commitments of the scheme. When they realise the vast expenditure which is involved they are inclined to be more sympathetic and helpful. The printed circular is quite suitable for this purpose, and this should explain the scheme simply, emphasising the benefits which it will confer, and giving a few statistics such as the number of consumers to be changed over, the number of lamps to be replaced, and estimated expenditure.

A brief description may then be given of domestic appliances which should be in every home. When the consumer is being forced to think about things electrical he should be called upon by an outside representative. This intense sales drive must just precede or coincide with the change-over. To follow up the printed letter a month afterwards yields poor results. Another useful method is to interest people in the change-over by advertisements in the local Press and on the screens of local cinemas.

Some supply authorities to my knowledge are spending thousands of pounds on change-overs and are not gaining publicity from their expenditure, whereas by a little money spent on a well-thought-out publicity campaign the conversion may not prove a great burden on the future revenues of the undertaking, but will contribute to a considerable degree to future earnings.

Consumers should be advised on all printed matter that a change-over is in progress and that prospective purchasers of all-mains wireless sets should see that they are suitable for a dual voltage. Where a set is working on the old voltage a small step-down transformer costing about 10s. is the cheapest method to adopt. Another economy can be practised in the replacing of spirals in cookers, radiators, kettles, toasters, hotplates, &c. It is well worth while to invest £10 to £20 in the purchase of a small lathe. Spirals of all descriptions can then be wound at a remarkably low figure.

High-pressure Electrolysis of Water

THE electrolytic decomposition of water into hydrogen and oxygen at pressures up to several hundred atmospheres is a convenient means of utilising surplus electrical energy. From this standpoint, says H. Niederreither in *Elektrotechnische Zeitschrift*, the constant-pressure electrolyser offers the advantage that it can be operated at full-load at any time, whereas the input to a variable-pressure electrolyser must be regulated in proportion to the pressure. Also, the gas tanks of the constant-pressure apparatus can be emptied without affecting production, and the purification of the gases is facilitated. In the "Nila" constant-pressure electrolyser, operating at pressures up to 2,840 lb. per sq. in., as many electrolytic drums as may be necessary to obtain the desired capacity are operated in parallel. Each of these contains cells built on the filter press principle with provision for collecting gases above and supplying electrolyte below. Nineteen cells, each with eight sets of electrodes in parallel, are connected in series. The pressure drum or container is about 3 ft. 3 in. long and 7¾ in. internal diameter. With a current flow of 370 A, the cell voltage is 2.06 V at 80 deg. C. (176 deg. F.), and the power expenditure per drum is $19 \times 2.06 \times 370/1.000 = 14.5$ kW approx. The normal output of each electrolyser is about 113 cu. ft. of hydrogen and 56.5 cu. ft. of oxygen per hr., and the maximum over 140 cu. ft. of hydrogen and 70 cu. ft. of oxygen per hr. A 180-kW plant in the Druckzersetzer G.m.b.H.'s research department at Munich, with a total output of 1,400 cu. ft. of hydrogen and 700 cu. ft. of oxygen per hr. has been in satisfactory operation for several years.

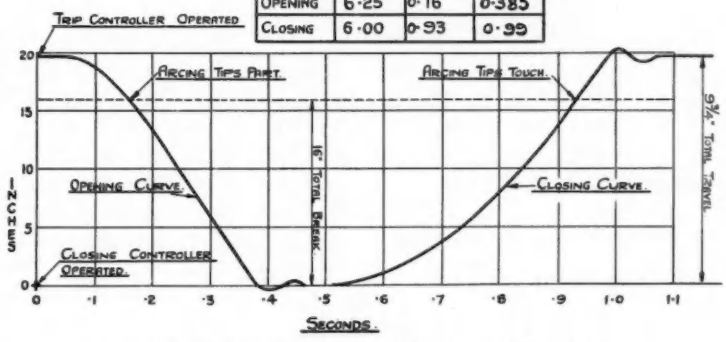
Trends in Power Control.

A study of circuit-breaker design and methods of employment

By C. C. Garrard, Ph.D., M.I.E.E.

IN an article published in the ELECTRICAL REVIEW of November 2nd the tendency towards the elimination of time elements in protective gear was discussed. It was indicated that quick action of the circuit-breakers was needed to obtain the maximum benefit from this development. The accompanying figure, relating to the characteristics of a typical large oil circuit-breaker, shows the time taken for the mechanism to start moving and the time taken thereafter to clear the arcing contacts.

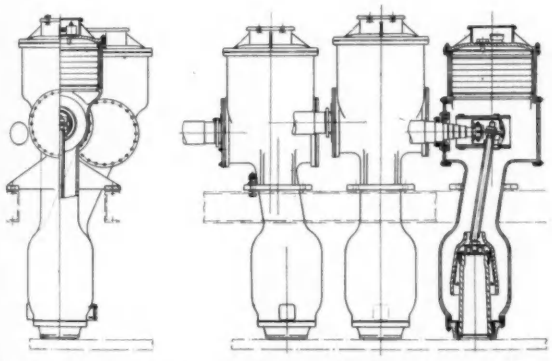
	Speed Ft. per Sec.	Time Lag Sec.	Total Time Sec.
Opening	6·25	0·16	0·385
Closing	6·00	0·93	0·99



Operating characteristics of a typical large oil circuit-breaker

Methods of arc control are being steadily improved. Generally they take the form of an enclosure round the arc, the so-called "explosion pot." Since the first simple design of Hilliard, this has undergone considerable modifications, mainly in the direction of arranging auxiliary side vents in the pot which result in a cross blast or jet of oil passing through the arc, which is very effective in rupturing large amounts of power. It is found that the most effective size of these vents varies with the current ruptured.

Variable vents have, therefore, been proposed, and included



Outdoor metalclad 33-kV switchgear with diaphragm expansion chambers

in this class is that invented by Kaufmann. Here the pot is formed of a number of rings pressed together by springs; the internal pressure (which varies proportionately to the current broken) forces the rings more or less widely apart, so that the size of the vent is proportional to the current dealt with. This construction is used by Siemens in their expansion circuit-breaker.

The Oil-blast Breaker

Allied to the explosion-pot breaker is the oil-blast circuit-breaker in which oil is forced by a pump between the arcing contacts. This device was originally invented (although not developed) by Ferranti some thirty years ago. Its latest form is that of the impulse breaker constructed recently by the American General Electric Co. The 138-kV breakers constructed according to this design have four breaks per phase, each break being 3.8 in. long. Oil under a pressure of 100 lb. per sq. in. is forced through the gaps at the moment of opening. The interrupting capacity is stated to be 1.5 million kVA, three-phase, at 138 kV.

This circuit-breaker has also a very quick release mechanism. It is claimed that the trip latch releases in about 1/300 second, the contacts separate in 0.03 second, and that complete interruption of the circuit takes place in a total time of 0.046 second, reckoning from the instant of making the trip coil circuit; these tests were made at 60 cycles. This shows what can be done by clever design in quickening up the operating time of switchgear for the heaviest duties demanded by modern conditions.

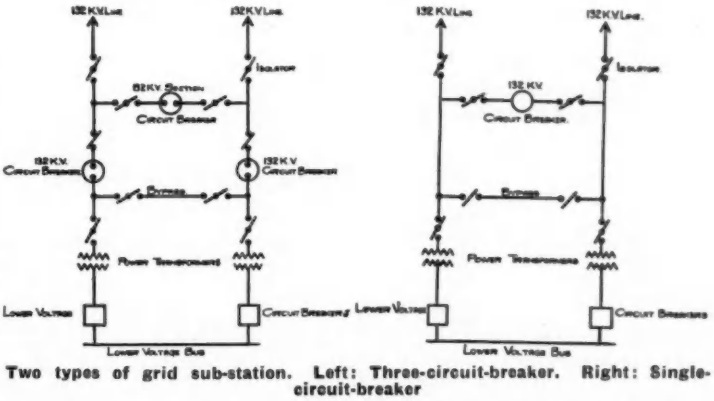
A number of impulse circuit-breakers have been ordered by the Bureau of Water and Power of the city of Los Angeles for the protection of the 287-kV line connecting that city with the Boulder Dam power plant. The impulse circuit-breaker is only one of a number of new high-voltage circuit-breakers which are attempts to find a less cumbrous substitute for the bulky and expensive oil circuit-breaker. The lines upon which these breakers have been developed are first of all to reduce the bulk of oil. The enormous quantities of oil in conventional h.v. breakers are rendered necessary, not by considerations of breaking capacity, but of insulation.

If, however, the oil is replaced or reinforced by solid dielectric the dimensions can be reduced immediately. Secondly, the length of the breaks has been reduced, resulting in a great reduction of the arc energy. This facilitates rupture of the current and allows a further reduction of the amount of oil; at the same time it favours rapid operation. Thirdly, designers have striven to construct circuit-breakers without bushings, and to replace these by post-type insulators, which besides being cheaper are, for equal size, more resistant to flash-overs caused by voltage surges.

A good example of these tendencies is the new 100-kV expansion breaker recently introduced by Siemens. This has one break per phase, the length of which is only about 12 in. The extinction of the arc is accomplished by a Kaufmann type of expansible explosion pot filled with oil.

An isolating switch is mounted integral with the circuit-breaker and forms a part of the operating mechanism. By turning the insulator supporting the isolating link a rotating motion about its own axis is imparted to the link which acts upon the circuit-breaker mechanism. When this has been released and the breaker is open, continued turning of the insulator liberates the link, which is disconnected from the circuit-breaker and moves bodily away from it; by this means a considerable economy of porcelain is obtained. A somewhat similar design is the "orthojecteur" designed by the Ateliers de Constructions Electriques de Delle in France.

In spite of the considerable efforts that have been made, attempts to eliminate oil entirely from high-voltage circuit-breakers do not seem to have been an unqualified success. Oil-less circuit-breakers are of two kinds, the compressed air type, in which a blast of previously compressed air is used to quench the arc, and the so-called "expansion" circuit-breaker, in which the arc is relied upon to produce a supply of vapour under pressure by evaporation of a liquid such as water. Upon the pressure being released the arc is supposed to be quenched by the vapour condensing around the ions in the arc column.



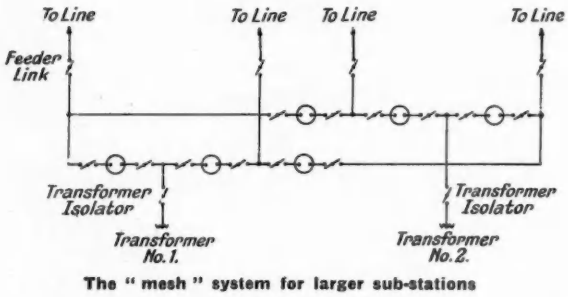
Two types of grid sub-station. Left: Three-circuit-breaker. Right: Single-circuit-breaker

The fact that Siemens, for instance, have found it necessary to replace the water in their switches by oil for pressures of 100 kV and over suggests that the action of the "expansion" breaker is more dependent on the passage of a flow of cool

quenching medium between the electrodes immediately after the arc is struck than upon phenomena of condensation.

In spite of the great attention paid to new forms of circuit-breaker the development of the conventional oil circuit-breaker is not being neglected. This has been particularly noticeable in the extension of the use of metalclad gear for outdoor sub-stations. Improved design, not only of the circuit-breakers, but of the whole construction of the bus-bars and auxiliary apparatus has resulted in the production of outdoor metal-clad gear which compares well both technically and economically with open-type gear. The higher first cost of metal-clad gear is offset by its smaller dimensions, greater reliability and ease of cleaning and maintenance.

It seems not unlikely that metalclad gear may be adopted even for pressures as high as 132 kV. Messrs. Reyrolle have, in fact, an installation in the grid sub-station at Tongland which has been in operation for some time.



The " mesh " system for larger sub-stations

In order to avoid the cracking of compound used for filling metalclad gear erected out of doors, oil filling is now adopted almost universally. Oil used for this purpose remains practically stationary instead of being circulated as is the case in transformers; precautions must, therefore, be taken to prevent the formation of conducting paths by the " lining up " in the direction of the potential gradient of the minute fibrous particles always found in oil. This is best done by interposing solid insulating screens or baffles of some oil-absorbent material between live parts and the containers.

If oil filling be used, the expansion and contraction of the oil must be allowed for by means of conservators, for instance. A new development is to subdivide the bus-bar chambers and spouts into a number of separate hermetically closed containers, each of which is filled with oil under a pressure of about one atmosphere. The variation in the volume of the oil is compensated for by means of a number of dilatable hollow discs filled with an inert gas, such as are used to maintain the pressure in oil-filled cables. An alarm indicates any fall of pressure due to leaks. In this way the infiltration of water into the chambers containing live parts and the access of air to the oil are rendered impossible, and early warning of leaks is given.

The controversy between the supporters of vertical and horizontol draw-out for metalclad gear appears in a fair way to being settled in favour of the vertical draw-out. On outdoor gear, arranging the spouts and female insulators on the bus-bar chambers vertically with their mouths downwards prevents the accumulation of dirt and moisture inside; with horizontal draw-out this is much more difficult.

If a suitable motor-driven hydraulically operated tank lifter is provided, the rapid raising and lowering of the circuit-breakers and removal of the tanks for inspection prevents no difficulties. In addition, expensive and complicated individual lifting gear is eliminated.

A further improvement is to mount the circuit-breaker operating gear on the supporting framework instead of on the breaker itself and connect it flexibly to the circuit-breaker so that this can be raised and lowered without disturbing the operating linkage, and can be operated in either the raised or lowered position. Testing is much facilitated by this arrangement, and in addition auxiliary contacts on the circuit-breaker for tripping and operating circuits are no longer necessary.

The need for economy in sub-station design has led to a number of interesting developments, of which some of the high-voltage sub-stations of the grid may be taken as examples. The minimum cost of tapping the grid, which a short time ago was from £20,000 to £25,000, has now been reduced to about £6,000.

The three-circuit-breaker station which was first used in Scotland and of which numerous descriptions have appeared in the technical Press, has been followed by the design of a single-circuit-breaker station, which is used on the S.W. England section. The protection of two transformers by a single-circuit-breaker has, of course, the disadvantages that a transformer failure results in the disconnection of one line. It was felt, however, that the occurrence of such faults was so unlikely that the risk was justified in view of the considerable economy achieved.

In the case of larger sub-stations the need for economy has been met by the introduction of the so-called " mesh " station. This is really a form of ring-bus system in which all the circuit-breakers are bus sectionalisers, and the bus-bars are constituted by the connections between adjacent breakers. With this arrangement it is possible to obtain a degree of flexibility approaching that given by a double bus-bar system, but with a considerable economy resulting from the absence of the bus-bars with their supports and insulators, the reduction of the number of isolating links and the suppression of the bus-coupling circuit-breaker.

Successful experiments which have been conducted lead to the expectation that in the case of some of the smaller 132-kV sub-stations, oil circuit-breakers may perhaps be entirely eliminated and replaced by liquid-filled fuses, resulting in a considerable reduction of first cost.

Electric Battery Vehicles in Germany

As part of the campaign to utilise home resources instead of imported materials, special efforts are being made in Germany to increase the use of electric battery vehicles. The case for these vehicles is presented in detail by Paul Fischer in *Zeitschrift des Vereines deutscher Ingenieure*, whence the following data are summarised as representing German practice.

The battery vehicle is primarily suitable for town and suburban service not exceeding 40 to 50 miles a day, or about 12,000 to 15,000 miles a year at a maximum speed of about 16 to 19 m.p.h. In large cities from 20 to 25 per cent. of the total number of vehicles fulfil these conditions, while in towns of medium size 50 per cent. or more of the vehicles do not exceed 40 to 50 miles a day in town service. Accumulator traction is not recommended for taxis or long-distance omnibuses, but is very suitable for shuttle-service buses with frequent stops. Electric trucks for industrial service, with lifting platforms and cranes if required, are very economical; about 14,000 are already in use in Germany.

The overall efficiency of battery vehicles is high. Usually it is about 60 per cent., based on motor efficiency 90 per cent. × battery efficiency 75 per cent. × charging plant efficiency 90 per cent. = 60.8 per cent. overall. With small rectifier charging stations the overall efficiency may fall to 45 per cent., but there are then compensating advantages in the capital and operating costs. Maintenance costs are small and a vehicle life of 15-20 years, corresponding to a mileage of 200,000-250,000 miles, is not uncommon.

The tax on battery vehicles in Germany is about 33 per cent. lower than that on other types, and the absence of inflammable fuel exempts their garages from the regulations applying to those for petrol vehicles. The consumption of electrical energy is 30-35 kWh a day for a mileage of 37½-50 miles. Battery-maintenance contracts can be arranged to the satisfaction of manufacturers and owners alike. The maintenance costs of battery vehicles used by the German Reichspost are from 40 to 50 per cent. of those of petrol vehicles, and data from other sources are still more favourable to the electric vehicles.

The weight of the batteries per kWh of discharge at the 5-hr. rate is about 220 lb. with formed plates, 132 lb. with armoured (Panzer) plates, and 88 lb. with pasted-lead or iron-nickel plates. The radius of action is about three times as great with pasted as formed plates for the same weight, but renewals are required more frequently. The life of pasted plates is usually about 350 discharges for the positives and up to 1,050 discharges for the negatives, corresponding to about 9,500 miles and 28,000 miles respectively. Automatic charging plant is available which reduces labour costs and prevents abuse of the cells.

Electric battery vehicles are already used in Germany to a considerable extent. The Reichspost, in particular, has used them for many years past and is adding steadily to the 2,500 already in its services. Battery vehicles are also used extensively by German municipalities for refuse collection, street cleaning, and other services, while the private users include establishments with internal transport, in works, warehouses, etc., and those maintaining house-to-house delivery services. It is estimated that at least another 50,000 battery vehicles could usefully be employed instead of petrol vehicles in Germany. The effect of this would be to reduce petrol and petroleum imports by about 99 million gallons per annum, and to increase the consumption of electricity by about 500 million kWh per annum, practically the whole of which could be taken during night or other off-peak periods, thus effecting a general reduction in supply costs.

The Single-phase Induction Motor. By W. M. Blagden

A new method of approaching an old problem

IN explaining the action of the single-phase induction motor the majority of textbooks start with the assumption that a single-phase, harmonically pulsating magnetic field of maximum value m can be taken as equivalent to two equal oppositely rotating fields, each of constant value $\frac{1}{2}m$. When the stator of the motor takes a single-phase magnetising current these two rotating fields are set up in it, each exerting its own torque on the rotor in its own direction so that no motion results.

If the rotor is given a spin in either direction these torques will no longer balance, and it will run up to a speed just short of synchronism. It is generally assumed that the increase in the forward torque and the decrease in the backward one are solely due to the changes in the slip of each field that occur as soon as the rotor is moved, and that the rotating fields themselves maintain a constant value. This is not true, and if the full load torque and current are calculated on this basis, very pessimistic figures will be obtained.

Consider first the rotor of a single-phase slip-ring motor at rest; if each of the two oppositely rotating fields induces $\frac{1}{2}$ V volts when cutting the rotor at the supply frequency f, the total induced e.m.f. will be V volts. If R is the resistance of the rotor and X its reactance at frequency f, the standstill current in the rotor will be $V \div \sqrt{R^2+X^2}$ amperes.

Next, imagine the rotor open-circuited and revolved at synchronous speed by some external agency. It will be keeping pace with the forward rotating field, and it will be cut by the backward one at twice supply frequency. The forward field will induce no e.m.f., but the backward one, which produced $\frac{1}{2}$V volts at frequency f, will now give V volts at frequency $2f$. Assuming that the inductance of the rotor is unchanged, its reactance will be 2X, so that on short-circuiting the rotor we might expect to find a rotor current of frequency $2f$ and magnitude $V \div \sqrt{R^2+4X^2}$ amperes. This, if R is small compared with X, will be roughly half the standstill current.

This does not happen in practice. There certainly is a rotor current, almost wattless, with a frequency of $2f$, but it is small, and the resultant stator current under these conditions is always less than twice the stator magnetising current.

Let m be the maximum value of the magnetising air-gap flux produced by the stator. If we assume that this flux is sinusoidal, we can regard it as two oppositely rotating fields, each of value $\frac{1}{2}m$.

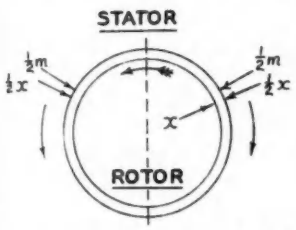


Fig. 1.—A motor at synchronism

When a current flows in the rotor, as a result of the backward rotating field, it is accompanied by a flux in the air-gap. Let x be the value of this rotor flux. The stator must then, by taking current from the mains, derive a corresponding flux which, in a three-phase stator, would oppose and neutralise x. Here it is a pulsating flux of maximum value x, and so, as shown in fig. 1, it can be regarded as splitting up into two oppositely rotating components, each of $\frac{1}{2}x$. The rotor current will be practically wattless, so the "load" fluxes will be in line with the magnetising fluxes, as shown in the vector diagrams of fig. 2.

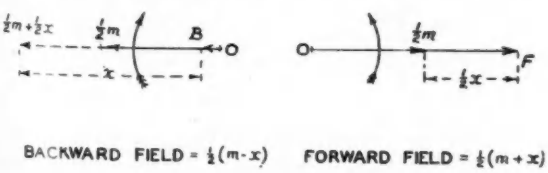


Fig. 2.—Vector diagrams

The effective air-gap fluxes are now found by resolving the vectors, the backward field being $\frac{1}{2}(m-x)$ and the forward one $\frac{1}{2}(m+x)$. The action of the rotor current is to strengthen the forward field and weaken the backward one, but the remnant of the backward field must be large enough to produce this current, and x can never be as great as m. Neglecting saturation and assuming the same number of turns in stator and rotor, fig. 2 can represent currents as well as fluxes; the resultant stator current $(m+x)$ is, therefore, always less than twice the magnetising current m.

The resultant of two unequal fields rotating in opposite directions is a field of varying magnitude rotating continuously in the direction of the larger one. This forward rotating field is like that of a three-phase stator, but it may be described as being elliptical instead of circular.

If the source of power driving the motor is removed, the elliptical field will maintain rotation, and the motor will run on load with slip, like a three-phase machine. This will alter the character of the rotating field, the eccentricity of which increases with the slip until standstill is reached, when the ellipse becomes a line. Fig. 3 shows the flux conditions when the slip on the forward field produces l amps. in the rotor at a p.f. of cos ϕ', and the backward field produces k amps. which we shall assume to be wattless.

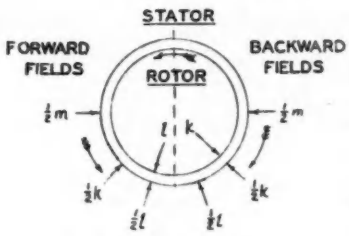


Fig. 3.—Motor on load

The fields themselves are changed. In fig. 4, OF is the new forward field, which is smaller than at synchronism; its axis has to lead on 1 by an angle $(90°-\phi')$. OB, the backward field, is bigger; its axis is in line with k. The vectors can represent stator currents as well as fluxes; they have been transferred to fig. 5, which is part of the circle diagram for the motor that takes no account of iron losses, stator copper loss or stator leakage flux.

Construction of the Circle Diagram

Draw OS$=m+x$ (the stator current with rotor short-circuited at synchronism), make ON$=\frac{1}{2}$OS, OM$=m$ (the magnetising current), and OP$=\frac{1}{2}$OM. On PN draw a semicircle. For a given load and slip, find the rotor impedance and the p.f., cos ϕ'. Draw $O\hat{N}G=\phi'$, meeting the semicircle at G, and draw a line OGF to meet it again at F. Join NF, which will make an angle $(90°+\phi')$ with OF. Draw SI, parallel to NF, and of length $2(m+x)/m-x$ times NF. Complete the figure as shown.

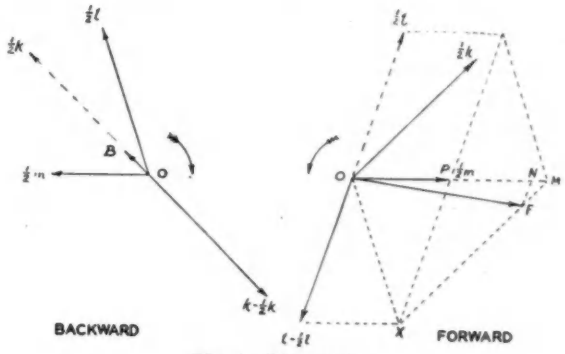


Fig. 4.—Flux vectors

Then OF is the forward field and OL the load current that it produces. It can be proved that the small semicircle is the locus of F. MF is the backward field and KI the current it produces. OI is the resultant stator current. As SI is parallel and proportional to NF, the point I will lie on a semicircle of diameter $x(m+x)/m-x$.

The forward torque is proportional to OL.OF cos ϕ', hence also to NF.OF cos $O\hat{F}N$, which is the area of the triangle FON. As the base, ON, of this triangle is constant, the area will vary with the altitude, being a maximum when F is at the vertex of its semicircle, and also when I is at the corresponding position in its semicircle. For any other value of current the torque will be proportional to the height of I above the diameter of the semicircle in fig 6.

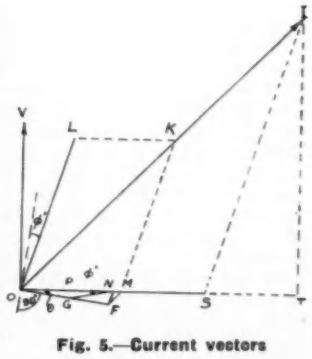


Fig. 5.—Current vectors

Our assumption that the backward current k is wattless

entails that the backward torque should be zero; actually it must be proportional to KI.MF times the sine of a very small variable angle ϕ''. KI and MF are both roughly proportional

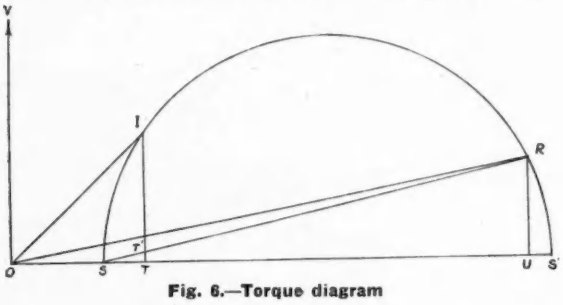


Fig. 6.—Torque diagram

to the current OI, so the backward torque is proportional to $OI^2 \sin \phi''$. In fig. 6, if OR is the standstill current, RU represents the forward torque, and as the two torques are equal at standstill, it can represent the backward one also.

At synchronism, when OI=OS, and sin ϕ'' is reduced by one half, the backward torque is negligible by comparison. It can be shown that for any intermediate current the height of the line SR above SS′ represents the backward torque, just as that of the semicircle does the forward torque, and for the current OI the net forward torque is represented by the intercept IT′.

The slip is proportional to tan ϕ', *i.e*, to the intercept to NG (fig. 5) on any fixed vertical line. In fig. 7 a semicircle has been drawn proportional to the semicircle PGFN; SG′ being proportional to NG, its intercept on the uniform vertical scale at S′ is a measure of the slip.

The foregoing is the simplest treatment of the subject. The

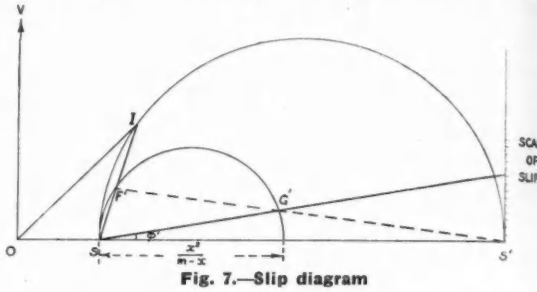


Fig. 7.—Slip diagram

diagrams can be corrected for losses and leakage in the usual way, but this would tend to complicate them to a considerable extent.

The Small Undertaking. By D. J. Williams, A.M.I.E.E.

Effective financing and cheap bulk supply needed

THE increase in the number of small authorised undertakers has been responsible for the diversity of tariffs and methods of charging in different areas. Undertakings that generate electricity can offer a tariff proportionate to their costs of production, which are flexible, but those buying in bulk are rigidly bound to a purchase price based on a two-part tariff, *e.g* , 10s. 6d. per kW of maximum demand per month, and 0.5d. per kWh, which amount includes a fuel charge.

With the smaller undertaking the difficulties of domestic development are particularly acute under existing bulk supply tariffs, unless it is situated adjacent to the grid from which supplies will be obtainable at £3 5s. per kW per annum, plus about 0.2d. per kWh. An authority remote from the grid is compelled to take supplies from another authority linked with the grid, and it will be saddled with additional capital charges on transmission mains. This will inevitably clog the machinery of domestic electrification and prevent the Central Electricity Board from granting cheap bulk supplies in such cases.

A high bulk supply tariff will effectively retard development of the domestic load in colliery districts especially. As fuel in these areas is cheap electricity at anything like 1d. per kWh for heating and cooking is not attractive to consumers.

Before the 1919 Electricity Act large power companies granted supplies chiefly for colliery and industrial purposes. In a number of cases the mains of the companies passed through the areas of local authorities which subsequently promoted Acts of Parliament for the purpose of distributing electricity locally. Supplies have been taken from a main already in commission, and the costs of connection have been borne practically in their entirety by the authorities concerned. These connections have become an asset to the power companies, and it is unfair that small undertakings should pay transmission charges on mains laid before the operation of the grid scheme. I believe the Board will be compelled ultimately to embody a standard charge to cover local transmission throughout the country.

During recent years there has been a tendency for small undertakings to amalgamate; it is a matter of opinion whether such amalgamations will cure some of the diseases of the industry. In the initial stages we shall probably be unaware of any noticeable improvement, but it is reasonable to assume that benefits are likely to accrue later.

Problem of the Scattered Area

In 1929 an Act was passed under which amalgamations agreed upon must be approved by County Councils and a programme completed as soon as practicable. In a number of cases small amalgamations of this nature will prove beneficial to trading undertakings, but while this is a move in the right direction it will not solve the problems incidental to economic distribution. One undertaking with a congested area and a prosperous business centre can make substantial profits from the undertaking and develop out of revenue. A similar undertaking with a scattered area must carry out extensions by loans. Interest on loans, and loan repayments, demand serious consideration as they may have a tendency to retard development.

The object of the grid is to grant supplies to all potential consumers, irrespective of whether they are situated in congested urban or rural areas. Restrictions on the borrowing of capital, and lack of adequate revenue to finance extensions, almost preclude the possibility of small undertakings supplying isolated consumers, whereas large undertakings in control of congested areas and making substantial profits can afford to carry out unremunerative extensions with every possibility of their becoming remunerative in the future.

While it has been found necessary to rationalise the production and distribution of electrical energy in bulk, the rationalisation of l.v. supplies still remains as a problem of extreme urgency, as distribution must keep abreast with the power supplies available.

In my view, the success of the grid scheme depends upon the systematic rearrangement of the innumerable distribution areas. To carry out this project it would be necessary to promote further legislation embodying clauses for securing the interests of the consumer against any evils which might be fostered by a monopoly of distribution in a particular zone.

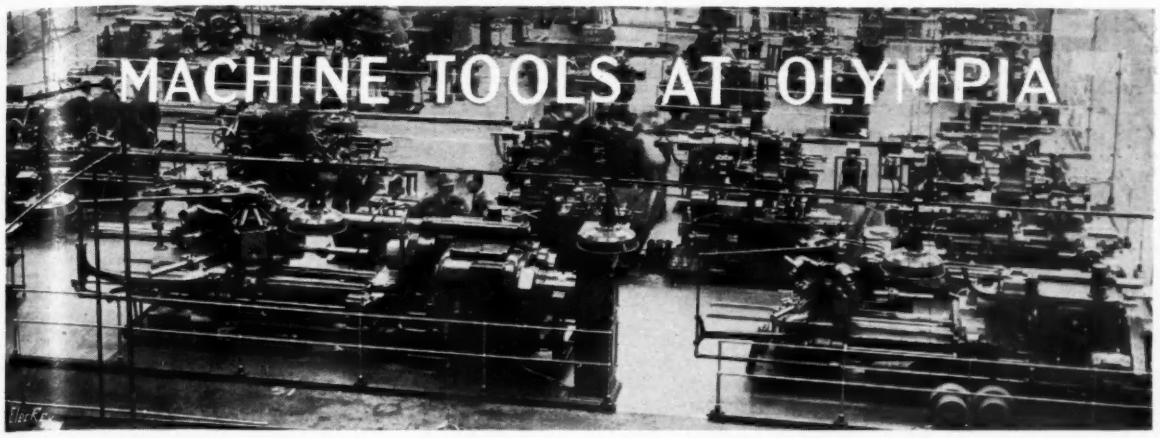
Considerable objection will be offered to the suggestion that the small undertakings should become subject to amalgamation, but the only reasonable objection would come from manufacturers of electrical material in which many supply companies have invested capital.

Rationalisation Required

The success of the grid scheme depends absolutely on the future development of the authorised distributors. In view of the economic factors involved and the local conditions of the small undertakers who cannot or will not develop their undertakings, rationalisation is the only effective method of dealing with this problem. Development of the domestic load cannot take place unless an attractive two-part tariff is offered to the consumer. In districts where coal fuel is cheap and gas is supplied in the region of 8d. per therm, bulk supply tariffs must be available at not more than £3 5s. per kW per annum, plus 0.3d. per kWh. Where both electrical and gas undertakings are controlled by one municipality, adequate facilities must be granted for developing the domestic load by electricity.

At this stage, lack of organisation and reduction of expenditure on the distribution side would render largely inoperative the capital commitments already embarked upon by the C.E.B. and by undertakings in connecting up to the grid. Rationalisation on the generating side has produced an ample supply of energy in preparation for this development. The small undertakings must be financed effectively to enable them to carry out domestic electrification, and bulk supply tariffs must be such as to enable them to offer to their consumers an attractive two-part tariff. Without these facilities the only alternative is amalgamation with the larger undertakings.

MACHINE TOOLS AT OLYMPIA

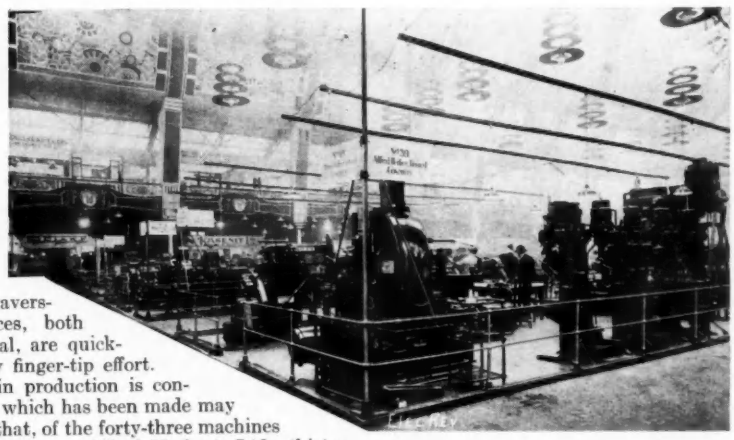


THE Machine Tool and Engineering Exhibition (Olympia, November 8th to 24th) depicts how completely the machine tool manufacturer has brought himself into line with the development of production shop methods and requirements. According to ex-Provost W. B. Lang, chairman of the Machine Tool Trades Association, the display comprises 1,100 machines, ranging in weight from a few pounds up to 40 tons, the value of the 10,000 tons of plant on view being at least £1,000,000.

The exhibition, which was opened by Sir Bolton M. Eyres Monsell, First Lord of the Admiralty, is the fifth of a series ordinarily held every fourth year. Adverse trade conditions caused the 1932 event to be postponed, so that six years have elapsed since an opportunity last presented itself of judging the progress which has been made.

Conglomerations of line and counter shafting with flying belts have definitely gone; group driving is giving place to self-contained individuality. Instead of one motor driving many machines, a single machine performing many operations is driven by several motors in combined sequence as determined by a master control panel.

The advent of alloy steels has called for materially higher cutting speeds, and consequently greater power, rigidity, and durability of the machines utilising the new cutting tools. Other important developments have resulted in the reduction of idle time and physical effort on the part of the operator. Air-operated and magnetic chucks and new speed-changing, traversing and feeding devices, both mechanical and electrical, are quick-acting and require only finger-tip effort. The resulting increase in production is considerable. The advance which has been made may be judged from the fact that, of the forty-three machines exhibited at Olympia by Messrs. Alfred Herbert, Ltd., thirty-four represent entirely new design and have never before been exhibited. This company's milling machines are characterised by individual motor drive in combination with ball or roller bearings to all shafts. Some of the smaller models have electrical automatic quick-power traverse, and others auto-electrical longitudinal feed.



A section of the Machine Tool and Engineering Exhibition at Olympia, including a display by Messrs. Alfred Herbert, Ltd.

When self-contained high-speed electric drills are used in place of the older belt-driven types it is said that from 25 to 33 per cent. fewer spindles are needed to do the same work. All-electric drilling machines are supplied with up to four spindles, and a.c. types are arranged for electrical speed changing.

Besides its own machines, Messrs. Alfred Herbert, Ltd., are exhibiting forty-seven machines of other British, American and German makes. The Keller automatic tool-room machines produce dies of all kinds within fine limits from master templates. The copying process is controlled by combined electrical and magnetic means, the horizontal, vertical and transverse motions of the cutter duplicating any irregular three-dimensional form.

The new Norton grinders have been developed in collaboration with motor manufacturers, and the adoption of automatic mechanical, hydraulic and electrical control has reduced idle time and minimised inaccuracies, thus considerably speeding up production.

Fellows recess-type machines for lapping gear teeth after hardening are automatically consistent without dependence on the skill of an operator, for the reason that the time of lapping is pre-set and controlled electrically.

High-speed lathes are made by Messrs. Dean, Smith & Grace, Ltd., with both motors and control gear enclosed in the foot of the machine and operated by built-in push buttons. The flange motor drive is either through a multi-plate clutch with a brake which does not stop the motor, or through a gear box with the motor on a swinging stand within the foot.

Messrs. E. G. Herbert, Ltd., make metal sawing machines in fifty-three models, with single and three-speed motor drives. The company also shows a motor-driven saw-sharpening outfit and an electric furnace for treating test specimens.

Girder radial and single column drills with up to eighteen spindle speeds and nine feeds, a separate motor for elevating the arm, and an electric lock for the arm and saddle are exhibited by Messrs. Geo. Swift and Sons, Ltd.

Messrs. Noble & Lund, Ltd., have large lathes with the main drive and saddle movements controlled by push-buttons on the saddles, the latter being moved along the bed by separate motors. Cold metal sawing machines have multiple vee-rope motor drives.

Messrs. W. Asquith, Ltd., fit built-in motors with push-button control and electrical tapping reverse eliminating clutches. A high-speed radial drill has been built with the main constant-speed motor mounted vertically on the side, giving eighteen spindle speeds; nine rates of feed are available and the reversing motion for tapping is obtained electrically. The arm is elevated by a separate motor at the top of the column, and a single "gate" switch controls both driving and elevating motors.

Motors of 15 and 25 h.p. drive the machines of Messrs. Geo. Richards & Co., while one of the exhibits of Craven Bros. (Manchester), Ltd., is a roll turning lathe weighing nearly 40 tons and driven by a 35-h.p. variable speed motor; a screw cutting lathe has a 50-h.p. motor.

Messrs. Wadkin & Co.'s range of electric wood-working tools for use in the pattern shop includes a router with the motor mounted directly on the cutter spindle, which runs at up to 24,000 r.p.m. Messrs. E. H. Jones, Ltd., show a 5-ton motor-driven press, and a 200-ton trimming press is on the stand of Messrs. B. & S. Massey, Ltd., besides motor driven spring and pneumatic hammers up to 5 cwt. Messrs. Greenwood & Batley, Ltd., show a lead tube extruding press, an automatic screw thread rolling machine, and cold forging and trimming machines for making bolts direct from steel wire, all driven by small motors.

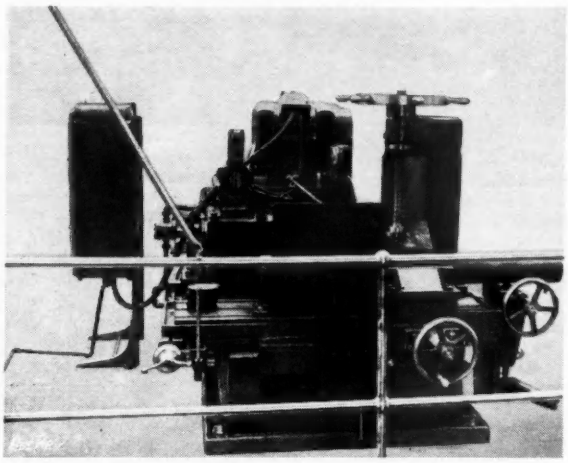
Motors and Control Gear

Motors made by Brook Motors, Ltd., are to be seen driving many of the main exhibits. On the company's own stand is a variety of units of from 2 to 10 h.p. designed for high torques

and low temperature rise; also flange types for direct assembly and rotors and stators which the machine maker incorporates into the tool. A noteworthy item is a motor specially constructed to withstand 30 reversals per minute for use on radial drills. Push-button and other starters are specially made for three-phase tools.

"Metrovick," English Electric, and Crompton Parkinson motors are in evidence; also Brookhirst, Ellison, and "E.E." starters, while some of the larger machines are controlled by "M.V." and Watford contactor switchgear.

Push-button and automatic controllers made by the Igranic Electric Co., Ltd., are prominent features of many of the main exhibits, supplemented by the company's own stand,



A cold saw demonstrated by Messrs. Noble & Lund, Ltd.

with demonstrations of four-speed pole-changing controllers for multi-speed squirrel-cage motors, and of "plugging" control where quick and accurate stopping is essential. Other items include magnetic contactors, relays, clutches, electric brakes, magnetic separator pulleys, low voltage transformer-switch-fuse equipment for the individual lighting of machine tools, safety latches and plates to prevent inadvertent starting, and electronic timers for spot welders.

On the stand of the British Thomson-Houston Co., Ltd., a four-speed change-pole geared motor having a ratio of 10 to 1 gives a choice of eight speeds, four from the second motion shaft and four direct from the motor spindle. Mounted on top of the motor is a change-pole selector switch, by means of which the various speeds can be operated while the load is maintained. This exhibit also demonstrates the action of the new reverse-rotation relay for instantaneous stopping of the machine. The relay ensures that the motor does not run in the opposite direction, since it de-energises the "plugging" contactor when the machine speed has fallen to a predetermined value.

For beltless extra-high-speed drives motor equipments can be supplied for 24,000 r.p.m. or higher, the high-frequency power being obtained from a single unit frequency changer of 300 or 200 cycles and control gear with push-buttons. There is also a 5-h.p. motor designed for up to 60 or 100 reversals per minute with control by reversing contactor.

In connection with built-in units the B.T.H. Company is prepared to supply any type of built-in control gear and also a 6 gal. 22 ft., three-phase motor suds pump for supplying lubricant to the cutters of machine tools; "Fabroil" non-metallic gears and pinions, and various types of control gear.

Messrs. Milne and Longbottom have a range of motor control gear, automatic starters, the Robinson low-voltage lighting system for machine tools, and the "Elm" desk lamp. Engineering Products, Ltd., exhibit "Kay" switchgear, various kinds of automatic control gear, electrically operated valves, pressure switches, and controllers for machine tools, refrigerators, compressors, &c.

Portable Tools and Magnetic Chucks

Messrs. Buck & Hickman, Ltd., demonstrate portable electric screwdrivers, drills and grinders. A selection of "Rotax" portable drills and grinders of both the universal and high-frequency types is on the Herbert stand. Hand tools are also marketed by Messrs. Geo. Hatch, Ltd., and the Wolf and "Micoxet" makes are to be seen on the stand of Messrs. James W. Carr & Co., Ltd. Messrs. Desoutter Bros., Ltd., have bench drills and grinders, suds pumps, and self-contained electric air compressors; G.E.C. portable drills are on the stand of Messrs. C. Churchill & Co., Ltd., and "Val d'Or" brands on that of Messrs. E. L. Youngleson, Ltd.

The Flexible Shaft Manufacturing Co. caters for driving delicate instruments by 2-mm. shafts up to shafts for transmitting 3 h.p. at 2,000 r.p.m. Messrs. F. Gilman (B.S.T.) Ltd., also offer flexible shafts for driving tools and boiler-tube scaling machines.

Magnetic Chucks

Churchill, Lund, Lumsden, Snow and "Modern" machines are shown fitted with magnetic chucks made by Messrs. J. H. Humphreys & Sons, whose range of types includes a circular disc 72 in. in diameter; they have made swivelling magnetic chucks up to 13 ft. in length.

In addition to motor-driven tools, Messrs. E. H. Jones (Machine Tools), Ltd., market novel magnetic chucks with multiple "toast rack" type closely spaced pole faces, and hand models for holding small objects while grinding and polishing. The Rapid Magnetting Machine Co., Ltd., makes separators, clutches, lifting magnets, chucks, and magnetic drums and pulleys without "neutral spots."

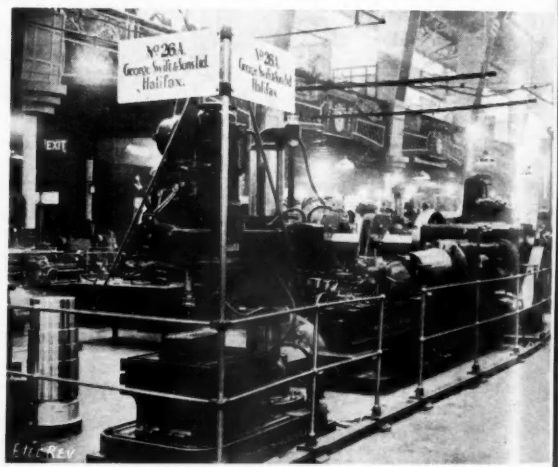
Furnaces and Welders

Besides tools, Messrs. A. C. Wickman, Ltd., show three "Birlec" furnaces for hardening treatment, two for temperatures up to 1,400 deg. C. being fitted with "certain curtain" atmosphere control equipment; the other is for low temperature tempering and annealing, having a centrifugal fan for interior air circulation.

Brayshaw Furnaces & Tools, Ltd., build and supply certain types designed by the Electric Resistance Furnace Co., Ltd., including a hot air tempering model with a "gill" fan and a self-regulating balance furnace for hardening steel; also temperature recorders and automatic controllers.

Messrs. Wild-Barfield Electric Furnaces, Ltd., make a "heavy hairpin" type with robust elements that can be replaced while the furnace is still hot. Forced-air circulation with charge-progress recorders, automatic hardening furnaces, and muffles are other features.

Sciaky Electric Welding Machines, Ltd., shows resistance spot welders, including a portable machine with automatic control; among weld-testing apparatus is an attachment that automatically registers good, weak and burnt welds, indicating simultaneously the nature of the welds by lighting coloured



Machines exhibited by Messrs. Geo. Swift & Sons, Ltd.

lamps, and, when necessary, automatically stopping the welder.

Besides machine tools, Messrs. Buck & Hickman, Ltd., show "Lincoln" welding plant of the automatic manual and petrol-driven portable patterns; also electrodes and the shielded arc method of welding.

Messrs. W. Canning & Co., Ltd., display a complete set of equipment for nickel and chrome plating as applied to machine tool parts. Messrs. E. N. Mason & Sons, Ltd., are makers of "Arclight" photo-printing equipment for drawing offices. New System Private Telephones, Ltd., supplies intercommunicating systems, loud-speaking "directaphones," staff-signalling systems, and multiple electric clocks.

The Record Electrical Co., Ltd., displays a range of electrical speed indicators, testing and measuring instruments. The Skefko Ball Bearing Co., Ltd., indicates the very comprehensive range of ball and roller bearings now available for machine and engineering application.

Research Lectures

The first of a series of four research and development lectures arranged by the British Science Guild to be delivered at the Royal Institution is one on "The Liberation of the Electron: its Industrial Consequences," by Mr. C. C. Paterson, on November 21st, at 9 p.m.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

British Water-power Possibilities

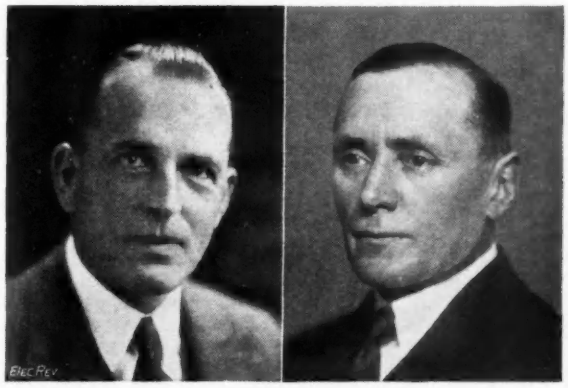
THE paper on "Hydro-electric Development in Great Britain, with special reference to the Works of the Grampian Electricity Supply Co.," by Messrs. A. S. Valentine and E. M. Bergstrom, was discussed at the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 8th. The paper was dealt with in our last issue (p. 643).

Mr. W. E. Highfield remarked that one pregnant sentence under the heading "The present situation in Great Britain" stated that "the economic standard by which the competitive possibilities of any water power development can be judged is, therefore, fixed, and it must be demonstrated that hydro-electric power in any given instance can produce power as cheaply as an alternative supply from coal on the same site." But he did not consider it correct to attach the rider, "on the same site," for what use was electricity on the site to anyone? It must be delivered to where it was to be consumed and the rider should read, "to supply the same load." It was the greater flexibility of the steam station with respect to the incoming raw materials that gave it advantages over a water-power scheme, which was tied to a natural site. On the Continent snow storage costs nothing whereas in Britain the cost of water storage was a determining factor.

The nearest grid point was nearly always more readily available to a projected power station than the load centre that had to be fed. The grid would considerably reduce the cost of water power, and in a much less degree of steam power also, when the cost was calculated as delivered to the load centre. For specialised commercial uses the cost of electricity must be cut so fine that even the losses caused by conversion from a.c. to d.c. must be avoided. In this country there was so little water power available that it might be worthy of consideration whether some of it should not be reserved for industry. The electricity produced in Scotland and Wales for the reduction of aluminium was worth more to the public than if it had been distributed for general use.

Mr. W. T. Halcrow, advising civil engineer to the Grampian scheme, considered the potential water power available to be more than the total stated in the paper, probably over 320,000 kW. He did not agree that some sites in Scotland were too isolated for development, though a few might involve the establishment of factories on site. The relative capital costs of steam and water would favour water power if the long view were taken. He hoped something would be done to undertake an inland water survey.

Mr. J. Williamson, who said he had been connected with the Galloway scheme since its inception, stated that the cost of extending water power plant was materially lower than that of steam extensions. Therefore there was a field for developing water power in West Scotland. Most water was available



[*Elliott & Fry*

Messrs. E. M. Bergstrom and A. S. Valentine, the authors of the paper on "British Water Power," read and discussed at the I.E.E. last week

in winter, just when more power was needed, and it would be a "quick-starting" standby for steam systems. The Central Electricity Board was fully alive to these aspects.

Mr. P. W. Seewer, as the designer responsible for some of the plant referred to by the authors, emphasised the fact that England could and had made water power plant, for which it was no longer necessary to go abroad. The potential power available at home was greater than was supposed, and in the Empire, too, there were opportunities. If British users would buy British plant they would help manufacturers to sell more of it abroad. They should have greater confidence in hydraulics and not pay quite so much attention to economics.

Mr. E. Kilburn Scott also spoke, and Mr. A. S. Valentine replied briefly in Mr. E. M. Bergstrom's absence on the Continent.

The Advance in Instrument Design

IN the course of his presidential address to the London Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS on November 6th, Mr. F. C. Knowles, of Messrs. Evershed & Vignoles, Ltd., reviewed electrical instruments and showed how the development of new materials and processes had made it possible to produce smaller, lighter and more accurate instruments, as well as to extend their application into fields not previously served.

In contrast with tungsten steel permanent magnets cobalt steel magnets had greater stability, were smaller and could be cast, and some qualities could be air-hardened, which was of great assistance to production as cracking was practically non-existent. Recently two new steels for permanent magnets had been produced, namely, nickel-aluminium-iron and nickel-cobalt alloys, both of which had a higher coercive force, although a lower remanence, than the cobalt steels at present in use; the maximum energy content was not much increased.

Mr. F. C. Knowles

In place of silicon steels, such as Stalloy, the introduction of nickel-iron alloys, such as Mumetal, had made it possible to use about one-eighth of the ampere turns previously employed in moving iron instruments, while instrument transformers could now be made so accurate that it was very difficult to detect any error. The introduction of synthetic resins of the phenol and urea groups also had given the instrument engineer a means of associating in a compact manner by means of a reasonably good insulator the various mechanical fittings in one moulded piece, while the use of the copper-oxide rectifier in instrument construction had changed the design and also application of many a.c. instruments. A further very useful development was the photo-electric cell.

The tenth edition of the I.E.E. Wiring Regulations stated that the resistance of an earthing circuit (conduit, lead covering, &c.) must not exceed one ohm and also that the resistance of the earth plate or other earthing device must not exceed one ohm. Whether the latter figure could be reached, especially in rural areas, still had to be seen, but for the first time in this country one had a value for the resistance of the actual earthing plate. While there were considerable advantages in having the earth plate resistance low, it was not always possible to get it down to one ohm, and greater advantage would probably accrue from a number of distributed earth plates.

Measuring Earth Resistance

The measurement of the resistance of an earth plate was not simple and straightforward, because the resistance to earth of any metal body which was in contact with the earth was not situated at one spot, but could be visualised as being a series of shelves of earth which were in contact with one another, and increasing in area as they got further away from the earth plate. The instrument in most general use comprised a hand generator on the shaft of which reversing commutators were fitted, enabling a testing a.c. to pass through the earth plate and the soil under test. The potential drop between the plate and the earth was rectified by one of the commutators, and an ordinary moving coils ohmmeter was used for indication. This instrument gave a direct reading on the scale of the actual resistance of the earth plate or earth structure to earth.

Another type of instrument developed in Germany was based on the fall-of-potential method combined with a form of a.c. bridge. In America an instrument had been developed utilising the Wheatstone bridge principle. There was a further instrument which consisted of a hand-driven generator

supplying a.c. and using an ohmmeter system combined with copper-oxide rectifiers.

It was very desirable before putting in an earth plate that the resistivity of the soil should be measured and the best site selected. A type of instrument similar to the first one described was used for this purpose and also for geophysical surveying by the electrical resistance method. For example, Professor Cox, of Cardiff, had been concerned with investigations in the South Wales coalfield with a view to ascertaining whether it was possible to detect the waterlogged areas which existed in some of the abandoned coal mines. Professor Poole and Mr. Whetton, of Armstrong College, Newcastle, had located concealed dykes and traced faults with success, while Mr. S. H. Shaw, of Birmingham, had investigated underground water supplies in Rhodesia by electrical resistivity.

In addition to electrical applications, large steel works, &c., were installing centralised indication and control, where physical quantities, such as gas, water, and steam flow, had to be indicated, recorded, and integrated in a central position, the indications being obtained by electrical means from an originating movement of the well-known physical types. There was also developing among the larger colliery systems an appreciation of centralised indication and control applied to the purchase and distribution of electrical energy.

Cinematograph Apparatus

CINEMATOGRAPH apparatus, with special reference to sound projection, was the subject of a paper by Mr. D. W. Hamilton, of R. C. A. Photophone, Ltd., which was read before the INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND on November 6th.

The author traced the history of sources of illumination, projector mechanism, lens systems and screens, the construction of which had been revolutionised by the advent of sound motion pictures. A modern film-recording system was explained and reproduction in the theatre discussed with reference to acoustic features of theatre design.

The latest type of recording might be done without altering the high-frequency compensation. The output from a contact print of the recorded film, when played on high fidelity reproducing equipment, was a faithful reproduction—within plus or minus two decibels over the frequency range of from 50 to 9,000 cycles—of the original sound or of the output of the film from which the re-recording was made. The operation of the equipment was greatly simplified by compensating entirely in one unit, the response of all the remaining units being essentially constant over the frequency range that it was desired to cover. This made it possible to record or re-record without the usual difficulty of varying the compensation to correct for the change in frequency response of the ear with an increase in sound intensity. As speech was nearly always reproduced at levels higher than the original, this compensation consisted in attenuating both the low and the extremely high frequencies. Thus the recorded speech might be amplified to the level required in the theatre without changing its quality. A switch on the microphone mixing panel controlled the attenuation while speech was being recorded entirely independently of the compensation for the processing losses required for recording all sounds, while both were required only when recording speech or other low-level sounds.

A standard 35-mm. recording equipment weighed approximately 500 lb. The galvanometer was electro-magnetic and more sensitive, making it possible to use a larger mirror to reduce the stray light and allow a greater depth of focus of the slit on the film, thereby resulting in a greater response at the high frequencies. Consistency of drum speed was achieved by electro-magnetic drive.

The velocity microphone consisted of a thin aluminium ribbon suspended in a magnetic field produced by permanent magnets. The sound waves caused this ribbon to vibrate in the magnetic field, thereby producing a voltage drop between the ends of the ribbon. A transformer was used for stepping up this voltage sufficiently to operate into the 250-ohm input of the microphone amplifier. One advantage of the velocity microphone was its ability to operate uniformly, independently of changes in atmospheric pressure, humidity, and temperature. Another important advantage was its directional property. Since the ribbon was suspended freely in space, sound waves approaching the microphone in the plane of the ribbon had no effect upon it. Sound waves impinging on either side of the ribbon and perpendicularly to the plane of the ribbon had the maximum effect.

Background and reflected noise could thus be reduced; the camera, if placed in a " dead " zone, need not be in a soundproof booth, especially for outdoor recording. The optical system differed from all others and introduced a method of reducing ground noise by depressing the light electro-mechanically on the film sound track.

Factors Influencing Factory Planning

ADVANCES in factory design in this country and the United States were commented on in the paper entitled " Factory Planning," by Mr. Hal Gutteridge, which was read before the INSTITUTION OF ENGINEERING INSPECTION (joint meeting with the British Works Management Association) in London on November 8th. He said that the greater use of electricity as the motive power was reflected in the fact that 90 per cent. of the 463 new factories established in 1933 in Great Britain employed electricity as their sole motive power. Parallel with the increased use of electricity was the improvement in design of electrically driven machines and particularly their individual and independent control. With such machines the problem of the most efficient layout became nearer to fulfilment, for the machines could be located to suit the product and entirely freed from any necessity to fix them permanently to suit the line shafting. The layout of the machines and processes in a factory were not regarded as necessarily static, for as the design of the product altered, new products were introduced or old methods were superseded by new methods, changes of layout might be made with advantage. These re-arrangements were facilitated when independently electrically driven machines were employed, for the provision of power at any point was an easy matter. Where such re-location of machines was likely to take place, intelligent anticipation would indicate where power cables should be arranged. These cables were frequently arranged, except in factories with overhead travelling cranes, in ducts overhead so that the tapping of power at any point was an easy matter.

Oil Engines and the Grid

IN the course of an address before the Scottish branch of the INSTITUTION OF MECHANICAL ENGINEERS at Edinburgh on November 9th, Mr. Charles Day repeated some of the contentions made in his presidential address to the Institution in London on November 2nd. Mr. Day stressed the importance of the application of specialist production methods to the production of machinery to be sold abroad. The greatest help towards securing high efficiency of production was a substantial home market, but one branch of engineering, namely, the manufacture of internal combustion engines, had been greatly hampered by Government policy, by which electricity was to be supplied from a few super-power stations. There were many cases where electricity could be supplied at a lower cost by the use of internal combustion engines than from the grid. The decision by Parliament that the public supply of electricity must be from a group of large steam power stations was in effect the adoption of a policy of disregarding developments in other branches of engineering. It was to be hoped that it was not too late to modify this policy and substitute for it one which would encourage every district and every industry to adopt the system which would provide motive power at the lowest cost. Apart from economic considerations national security should also be considered. The power transmission lines which now formed a feature of the countryside invited attack in case of war or other disturbance, and the breakage of even a few of them might have a very crippling effect.

Loeffler Steam Boilers

COMMERCIAL applications of the Loeffler system of steam production are discussed in the paper by Mr. S. McEwen which was read before the INSTITUTE OF FUEL in London on November 9th.

The essential principles of the method are briefly described as an aid to an appreciation of technical considerations and the economic advantages claimed for the system.

In comparing the capital costs of complete power stations, taking in one case a low- or medium-pressure steam station, and in the other high pressure under Loeffler conditions, so many factors are claimed in favour of the Loeffler system that no additional capital charges need be involved. The reduction in consumption of steam per unit generated; the reduction in fuel to be handled and consumed; the reduced heating surface; the smaller condensers; the lack of necessity for evaporators; the cheaper constructional work owing to reduced space occupied and position of boiler drums; the smaller diameter of steam piping and smaller size of valves, fittings, &c.; these items serve to indicate that it is reasonably possible to secure the economical advantages of high pressure and high-temperature steam without incurring increased capital or greater maintenance charges.

At the Vitcovice Mines, Steel & Iron Works in Czechoslovakia there are one 35,000 lb. per hr., two 100,000 lb. per hr., and two 150,000 lb. per hr. boilers of this design. At the Thermal Technical Institute in Moscow there are two 300,000 lb. per hr. units. At the Hoechst works of the I.G. Farbenindustrie three boilers are being installed, each of 70,000 to 100,000 lb. per hr. at a pressure of 1,800 lb. per sq. in. and a temperature of 930 deg. F. to supply a back-pressure turbine exhausting at 225 lb. per sq. in. into the steam main, which supplies steam at this pressure to the original back-pressure turbines; these turbines exhaust against a back pressure of 551 lb. per sq. in. for process purposes. By this arrangement an additional 7,000 kW may be obtained without any increase in the production of exhaust steam. In this case the Loeffler boilers are fired by travelling grate stokers.

The new power station at Trebovice was designed to generate 150,000 kW. The present steam plant consists of three Loeffler boilers, each having a maximum rating of 160,000 lb. per hr. at a pressure of 1,900 lb. per sq. in. and a temperature of 930 deg. F. The boilers are fired with coal having a calorific value of approximately 12,600 B.th.u. per lb. Two 21,000-kW Skoda turbines are installed; these are bled in three stages for heating the feed water to 405 deg. F. The steam leaving the first stage of the turbine passes to an intermediate superheater, wherein it is reheated by steam from the boiler to 645 deg. F.

* * *

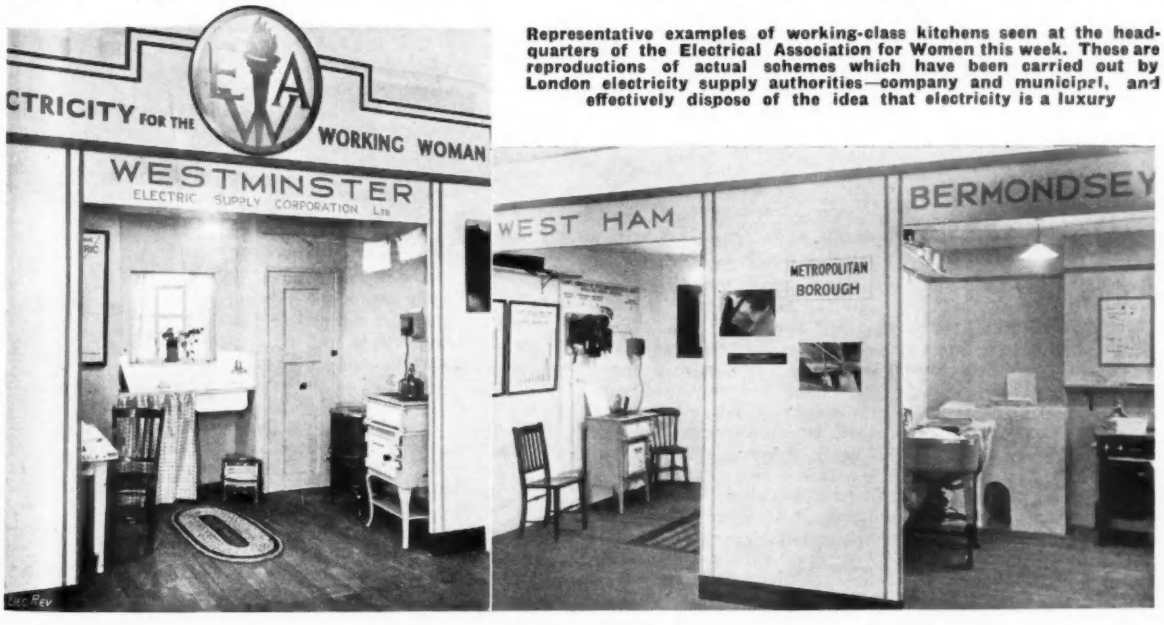
Circuit-breaker Testing

At a recent meeting of the North-Eastern Branch of the INSTITUTION OF MECHANICAL ENGINEERS Mr. B. H. Leeson, of Messrs. A. Reyrolle & Co., Ltd., gave a lecture, illustrated by films, on the short-circuit testing station at Hebburn, which is the largest in the world. Mr. Leeson pointed out that proving tests for certifying the safe rating of electrical plant in accordance with Standard Specifications were an imperative need of modern conditions.

Electricity for the Working Woman

AS a part of its tenth birthday celebrations, the Electrical Association for Women is holding an exhibition of "Electricity for the Working Woman" at its headquarters, 20, Regent Street, S.W.1. The chief features of the exhibition (entrance free), which is open from 10 a.m. to 6 p.m., are eight electric kitchens which are exact models of rooms existing in various districts in London.

Thus the L.C.C. Ossulton Estate, in St. Pancras, is represented by one of a block of 121 similar flats rented at 16s. 5d. per week. There are three in family and the cost of electricity, including a fair amount used for baking, is 4s. per week with 1s. 8d. per week for the hire of apparatus.



Representative examples of working-class kitchens seen at the headquarters of the Electrical Association for Women this week. These are reproductions of actual schemes which have been carried out by London electricity supply authorities—company and municipal, and effectively dispose of the idea that electricity is a luxury

A Stepney flat (17s. 7d. weekly) is one of a block converted from gas. Bills for power average 6s. 6d. per month, which include the use of an electric heater; hire charges are included in the rent. A force pump takes hot water from the wash-boiler to the adjoining bathroom. The tenant finds that 4d. will heat 10 gal. of water—enough for a family wash with one boiling of clothes—as against 8d. with gas.

The rent of the six-roomed maisonette in Cumberland Market is £1 6s. 1d. The tenants previously occupied a basement flat and the cost of gas for lighting alone was 7s. per week. Now from 3s. 6d. to 4s. is spent on electricity plus 1s. 8d. for hire of the appliances.

Westminster is represented by the kitchen of a four-roomed flat on the property of the Ecclesiastical Commissioners occupied by a family of three which spends about 3s. 6d. per week on electricity. A rent of £1 1s. 2d. includes hire charges. The electrical apparatus in the flat, copied from one in the Disabled Sailors' and Soldiers' Homes, was installed in 1923; no charges are made for hire and no rent is payable. Four adults, even with lighting at 8d. per week and power at 1½d., spent only 3s. 6d. per week on electricity, including cooking twice a day and two hot baths a week supplied from a specially quick 4-kW boiler. With reduced charges, the occupants are contemplating a constant hot-water supply.

The four-roomed flat at West Ham is inhabited by a family of seven. Hire charges are included in the rent of 11s. per week.

The cooker in the Bermondsey example has been in use for eleven years and the wash-boiler for nine. The week's wash for eight people can be done between 8 and 11.30 a.m.; by hand it took two hours longer for six people.

Supply to the Fulham four-roomed flat is given through a multi-coin meter taking pennies, sixpences, or shillings. The weekly rent is 25s., and the consumption 32 kWh for the family of four, including hot water from a storage heater over the sink.

Among the other exhibits is a revolving model showing three rooms and the garden of an all-electric house. Cable for the exhibition was supplied by the Cable Makers' Association, and the wiring was carried out by Messrs. Troughton & Young. A radiogram has been lent by the General Electric Co., Ltd.

The exhibition was formally opened on Monday afternoon by the Marchioness of Reading, who lighted the first of the ten candles on the Association's birthday cake, which is to be sold in aid of the funds of the Electrical Industries Benevolent Association. The Marchioness was presented by Lady Moir with an electric iron as a memento of the occasion.

In the evening, the tenth anniversary of the Association's formation (November 12th, 1924) was marked by the presentation to Miss C. Haslett, the director, of a diamond brooch. Mrs. G. Z. de Ferranti, in asking Miss Haslett to accept this token of appreciation of the members for her work, stated that the membership was now over 7,000 divided among forty-eight branches. Miss V. Norvick, assistant secretary, handed the director an album containing the names of staff and members of the E.A.W. The last of the three o'clock lectures will be given to-day, when Dr. Elizabeth Sloan Chesser will speak on housing and health; no charge will be made for admission.

The activities of the E.A.W. since its formation are dealt with in "An Electrical Adventure," by Peggy Scott, obtainable at 3s. post free from the Association.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

"What Becomes of Them?"

In a leaderette in your last issue under this heading you state that it would be nice to know what happens to contractors who are refused registration. Being one of these I will do my best to enlighten you, but I must give you my history first so that you may judge my case.

I have spent all my working life up to the present in the electrical industry in all parts of this country and others and have held responsible positions, private and Government. When the depression started I had been with a registered contractor for 5½ years (who, by the way, when I first went with him knew but very little of house installation) and being the highest paid man I had to get out first, leaving partly skilled labour and premium apprentices to carry on the cheap work.

I approached the National Register after I had been forced to start up on my own (8d., 10d., 1s. an hour being offered to me by registered contractors) and there was one clause which my late employer would not agree to, *i.e.*, that I had had five years as supervisor. This, I take it, failed me.

I tried the E.C.A.—again without success. This time I had to wait seven months for a decision. No statement was issued by either body why I had failed to qualify.

Regarding "jerry" work I can prove to you that in most cases my price per lighting point has been from 5s. to 8s. above that of any registered contractor, and my work has been superior. I do not employ boy labour or men at boys' wages, and, so far, I have never had an electricity supply company refuse to connect up my work, which cannot be said of many "registered" contractors.

Perhaps the explanation of why people, like myself, are not wanted in the exclusive ranks is that the responsible people consider that they have enough contractors in their district to suit their needs. They agree like nothing on earth at their meetings, and fight tooth and nail outside, but they are united in one thing only—to keep outsiders out.

I can still get quite a good living and have no one to thank for this but myself, my motto being "Good work, good pay."

November 10th. J. R. M.

An Electric Flat

With reference to recent correspondence in your paper regarding the use of electricity in the home, perhaps the experience of two friends of mine with a small flat will interest some of your readers.

Just over fifteen months ago they leased the ground floor of a somewhat spacious house, for a period of five years, and equipped it electrically throughout. The dining-room required some form of overhead lighting to make it attractive in conjunction with portable lamps and cornice lighting. A hanging pendant of amber glass was fitted, this colour predominating in the shades of the table lamps. A 15-A and two 5-A wall-plugs, with fused adaptors, were also installed. The larger one took a 2-kW imitation coal fire, and the smaller units provided for a clock fitted with a fused plug, a standard lamp, table lamps, a wireless set and several small appliances.

The walls of the lounge are covered with a thick paper resembling stippling in old ivory, and the paintwork is dull matt black. It is entirely lighted by artistic table lamps, a floor standard and wall brackets with shades ranging from deep rose to the palest pink. Heating is by an inset chromium-plated 2-kW fire mounted on a panel enamelled to give a black on white marble effect. Behind the piano a small tubular heating bar is fixed which has proved most valuable on damp days for keeping the ivories in excellent condition. The plug points in this room are the same as in the dining room, the wall brackets being controlled by a switch near the door.

The flat has two bedrooms, each provided with a pendant fitting over the dressing table, a table lamp conveniently close to the bed, and a small light over the wardrobe mirror. The latter is composed of a swan-necked bracket with a narrow reflector containing a tubular lamp fixed on to the top of the wardrobe. In each bedroom is a 1-kW radiator of the chromium tubular-frame type and plug points to take the other accessories.

In the bathroom a totally enclosed lighting fitting is installed. A 12-gal. water heater with thermostatic control has proved to be one of the most, if not *the* most, useful of the many electrical appliances used. The cylinder is fitted in a large cupboard, and sufficient heat penetrates through the lagging to allow for the airing of linen. A bowl fire is suspended from the bathroom ceiling, operated by a pull-cord switch. A small electric towel airer is also included.

The kitchen, though small, has received, perhaps, the most attention. Plans were drawn up and scrapped, only to be replaced by more ambitious ones. Finally it was decided to install as many labour-saving devices as possible. The casement window is very large. Under it is built the sink and draining board. Immediately next to it the electric cooker, complete with control, has been fixed. The advantages of this arrangement will readily be appreciated. A cupboard for saucepans, &c., is built under the draining board, and all cupboards have been fitted with glass doors. Great enthusiasm is displayed over the performance of the cooker. Among the points that commend it to the tenants are the smooth enamel finish, which makes it easy to clean, the rapid pre-heating of the oven and the absence of stuffiness in the kitchen when cooking. An electric wash boiler, which agitates the clothes thoroughly and is controlled by a three-pin switch-socket and plug, is considered by the domestic help "a wonder from Aladdin's Cave." A 5-lb. electric iron is part of the laundry equipment.

It is the intention of the occupants of this flat to install a small domestic refrigerator before next summer, as, owing to their being in for only two meals during the week, much food that could have been stored in a refrigerator had to be thrown away on sultry days. Owing to inexperience, in the early days of occupation electricity was not used quite as economically as it now is when the maximum efficiency and comfort is being obtained. Bearing this in mind, the total charges for the first year—£18 6s. 4d.—do not appear excessive. Very little heat is used between 9.30 a.m. and 5.30 p.m. on five days in each week, as the tenants are at business and the domestic help is there for only a few hours each morning, except on Monday when she is engaged for the full day.

Chester, *November 11th.* ANN PENRHOS.

A Handy Automatic Cable Grip

The remarks of "H. G. W." in respect of my cable grip described in the ELECTRICAL REVIEW of November 9th, although somewhat condemnatory, are fully appreciated as they provide a means for more fully setting forth its qualities.

"H. G. W." imagines, but quite mistakenly, that I have overlooked the pressure put on the cable by my automatic gripping means. I can assure him that a pressure of one ton on an area of cable surface of over 24 in. is precisely what was aimed at in the design, guaranteeing as it does that no dangerous "slip-off" can possibly occur. "H. G. W." should know that more pressure is put on a cable by junction box accessories and when four half-inch bolts are used for gripping than that resulting from my gripping device.

Another objection is that my gripper must be slipped on the cable from the end. Is that a real objection? The "basket" grip must be slipped on similarly, but advantage lies with my means, for the reason that the "basket" gripper must be kept on the cable end, while mine can be slipped along quite easily and quickly. I agree that divided "basket" grips are procurable, but who would use them when in charge of cable laying in crowded streets with a gang of men hanging about waiting while one of these was being laced on? Simple modifications of my grip are available. It can be provided with an open side so that the open side will pass over the cable, and the shoes slipped in, and/or the housing could be made in two parts and bolted together. But it is suggested that the grip as shown will be found quite satisfactory.

November 13th. CABLE MAN.

At the Shepperton studios where part of the E.D.A. films has been made

Standing: Mr. Alexander Esway (film director), Miss Betty Downe, Mr. R. S. Downe (Chairman, E.D.A. Council) and Miss Marjorie Ray. Seated: Miss Margaret Gunn as Norah in "Plenty of Time for Play." Sir William Ray (Executive Chairman, E.D.A.), and Miss Joyce Barbour as Betty in "Plenty of Time for Play."

Electric Cooking in a Hospital. By R. N. Tweedy

Details of running costs at a Co. Dublin institution

The author, endorsing the view that electric cooking is not expensive, produces statistics to show that at a Co. Dublin hospital, during three days' observation, the power cost per person of preparing, cooking and serving a meal with electrical equipment was 0.21d.

IT is often said that electric cooking is expensive. I have maintained that this is not the case, and since seeing the installation at Our Lady of Lourdes Hospital, Blackrock, Co. Dublin, I am in a better position to use the argument that electricity, at Dublin rates, is the poor man's fuel, for this hospital is dedicated to the service of the poor and it is administered by those who deem it wrong to spend more than can be justified by economic results.

The hospital is for patients suffering from pulmonary tuberculosis, and it has a resident population, including nuns and staff, of about 140, the diet being generous and varied. A supply of electricity is taken from a 10-kV line into a sub-station from which separate l.p. services are run to the convent, the old hospital and the extension. An auxiliary service is available at need from the l.p. ring serving the area. Plans are being prepared for more than doubling the hospital by the provision of a surgical tuberculosis side.

The main kitchen at the Co. Dublin hospital, showing some of the electrical equipment

It has not yet been found possible to abandon the oil-fired central heating of the old hospital, but all added space is heated electrically by "Highlow" tubes and "Floodheat" panels, the latter being used in the sun-parlours. The vertically directed heat-rays from the panels fixed at the apex of the glass roofs are particularly suitable for reclining patients, while losses which would arise with a convection heating system are avoided. The heating load is at present about 100 kW.

The main kitchen has a low ceiling and it must have been an uncomfortable place before its conversion to electricity. Now it is inviting at all seasons of the year, and the work is carried out in a more orderly fashion than was possible hitherto. No one seems to be fussed or flurried. The cooks know that turning certain switches at certain times will give them definitely uniform results and for this reason they are able to give more attention to measuring, mixing and preparing the dishes. The absence of fumes, steam-clouds and dust enables the apparatus, the tiled walls and the floor to be kept beautifully clean with the least possible labour. The kitchen is used between 7 a.m. and 7 p.m. Casual meals and hot drinks are provided at other times from the ward kitchens.

Observed Results

Recently the normal routine of the main kitchen was put under special observation for three consecutive days between 9 a.m. and 5 p.m. For a total consumption of 423 kWh the following kinds and quantities of food were cooked:—Vegetables: Mixed (30 lb.), boiled onions (14 lb.), grilled tomatoes (18 lb.), boiled cabbage (98 hds.), steamed potatoes (25 st.) Meat: Roasted (65 lb.), boiled (50 lb.), roasted chickens (10), fried chops (26 lb.), boiled hams (3), boiled shoulders (3). Fish: Fried (60 lb.). Soup: (12 gal.). Puddings: Steamed (16 gal. and 15 lb.). Tea: (100 gal.). Eggs: Fried (20 doz.). Unenumerated: Brown bread, tea cakes, toast, sauces, apple tarts, &c.

The number of complete individual meals served during the three days was 1,500, and there were also a number of calls for tea and hot drinks. At 0.75d. per kWh the 423 kWh consumed cost £1 6s. 5d. The average consumption per meal was 0.28 kWh. The average consumption of electricity was well under a kWh per head per day.

The food at the hospital is prepared, cooked and served by the following apparatus: A Siemens-Schuckert two-oven range with eight hot plates; an A.E.G. two-compartment pressure steamer; four "Burco" boilers, adapted for soup, vegetables, cereals, and boiling water; a Moffat toaster griller; a fish fryer; an Alexanderwerk 20-quart mixer; a Hobart meat and bread slicer and a potato-peeler; a Frigidaire 50-cu. ft. cold chamber equipment; and several Dooley electrically heated food trolleys, the first of the kind to be made in Ireland.

The hot water supply is provided by G.E.C. and "Sadia" thermal storage cylinders of from 100 to 6-gal. capacity, placed as near as possible to the respective draw-off taps. Spring taps are fitted in the lavatories to minimise waste. Moffat single-oven cookers are installed in isolated kitchens and a "Burco" boiler is used as a steriliser for ward utensils.

A new laundry, completely electrified, is about to be built. The existing laundry has a motor-driven washer, hydro-extractor and mangle, electrically heated ironer and hand irons. A bed-lift supplied by Wadsworth serves the three floors and the roof garden.

A Smith's synchronous striking turret clock—the first in Ireland, I believe—surmounts the building, and synchronous clocks are distributed through the wards. The 5-cwt. turret clock bell was cast by Byrne, of Dublin. Three radio-receiving sets feed numerous loud speakers in wards and nurses' quarters, much of the speaker wiring being carried on the face of the outside walls. An X-ray apparatus is being installed.

Space heating is an off-peak load and has given no ground for complaint, although the only heat storage to carry over the short peak period is the structure itself.

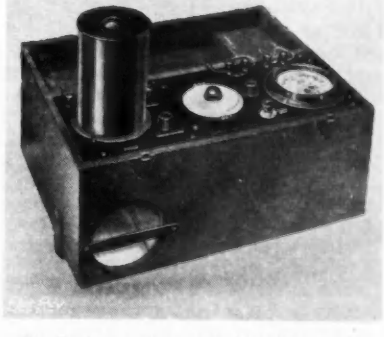
Thus, at a moderate capital cost a complete electrical service has been secured, and for an annual cost which could not be bettered by gas, coal or oil.

Some of the services rendered by electricity in a hospital are not within the scope of its competitors; while, with others, the manner in which the electrical services are performed with regard to hygiene, cleanliness, quietude, mobility and long life is, I suggest, a long way ahead of alternative methods.

I am indebted to the Irish Free State Electricity Supply Board, which carried out the installation, for the information contained in this article.

Determining Moisture Content

Our attention has been drawn to a self-contained and portable instrument, consisting of a thermionic valve combination in an oscillatory circuit, that has been designed by Mr. C. H. W. Long for rapidly determining the moisture content of substances such as corn, seeds, flour, beet-sugar pulp and coffee. A predetermined quantity of the substance is introduced into a cell mounted on the instrument. After switching on, the central dial is adjusted until maximum deflection is obtained on the meter shown on the right of the illustration; the centre dial reading is noted and the moisture content is read directly from a graph applicable to the substance under test. It is claimed that the complete operation occupies only three minutes, instead of from three to six hours by ordinary methods.



The instrument invented by Mr. Long

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The Three Films

WE wish to repeat our advice to electricity supply authorities to place their orders as soon as they possibly can for demonstrations of the E.D.A. national propaganda films. We are pleased to learn that down to the end of last week contracts had been signed for well on the way to 3,000 performances to be given in some thirty or forty towns during the season. One municipal authority in the provinces alone has ordered 250 displays.

In order that readers may gain a more ready and intimate acquaintance with the pictures than may have been conveyed already by our abstract of the stories, we now publish three representative "stills," one selected from each of the films, showing amongst other things how a quite attractive human element is used to promote a suitable atmosphere for getting home effectively and lastingly with the electrical story. The three films, let us state again, are "Well I Never!" "The Wizard in the Wall," and "Plenty of Time for Play." Engineers and company managers should write to 2, Savoy Hill, W.C.2, without any further delay. Whatever else they may be committed to in the way of publicity—and we hope they are doing much—the films should not be neglected.

Stills from the E.D.A. Films: 1. "Plenty of Time for Play." 2. "The Wizard in the Wall." 3. "Well I Never!"

Welding Forty Square Inches

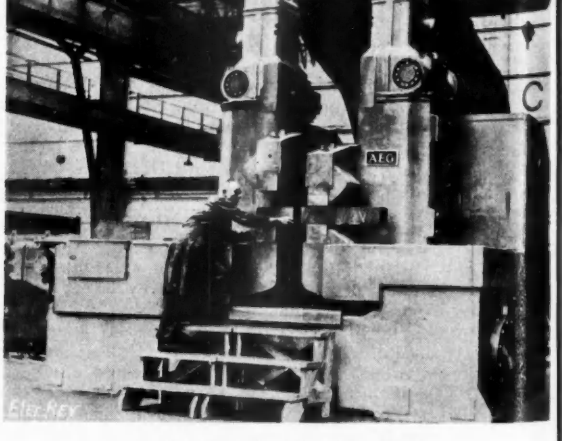
FOR welding alloy steel, such as nickel and chrome, an automatic control is needed to ensure that the weld is made at the moment when the correct upset temperature of the faces to be welded is obtained, otherwise a burnt or frozen joint may result. Both types of failure are well known in resistance welders employing a cam or hydraulically operated burn-off and upset, where the platen is moved forward at a certain definite speed and the upset made at a predetermined moment, neither of which can be altered during the welding process should the section be at too low a temperature for reliable upset. An automatic welder has been designed by the A.E.G. which relies for its control on the temperature of the weld. The machine illustrated is the largest of this type yet built, and is designed to weld an area of 40 sq. in.

According to the manufacturers, automatic control makes a considerably smaller peak-load call on the line, for the stock is preheated before flashing takes place, and thus the rush of current is much reduced. The intermittent rating of the transformer is only 800 kVA, while it is designed to give a continuous output of 400 kVA, to weld the maximum area of 40 sq. in. in 16½ minutes, using 47 kWh of electricity in the process.

Both the upset pressure and burn-off can be adjusted in a few moments without any alteration of gear wheels or cams by simply turning a pointer. The maximum clamping pressure is 70 tons and the maximum upset 50 tons, both being adjustable for sections down to 4 sq. in., which is the smallest area that can be conveniently handled on so large a machine.

The rating of these machines is based on the maximum demands of the user, which in this case was to weld 40 sq. in. about three times an hour where the metal lost in burn-off or flashing was $2\frac{3}{16}$ in. The machine will weld 20 sq. in. twelve times an hour, consuming 9.2 kWh for each weld, burning off 1 31/64 in. The various automatic controls are mounted in an enclosed switch cubicle entirely separate from the machine and protected from flash, as is the transformer, by a special arrangement of its position and design of the platen. The clamps, as well as the burn-off and upset, are operated by three-phase built-in motors, whose torque responds instantaneously to the load.

Repetition work calls for very fine limits, and so, although it weighs 40 tons, the machine is designed as a precision one, special attention having been paid to the guide of the platen to enable it to cope with the heavy upset pressure of 50 tons. It runs in bushes, which can very easily be removed and adjusted to take up wear.



The 40 sq. in. electric welder

The Manchester Electro-Harmonic Society

There was an attendance of about 250 persons at the opening smoking concert of the season of the Manchester Electro-Harmonic Society. The next event will take place on November 23rd at the Waldorf Hotel.

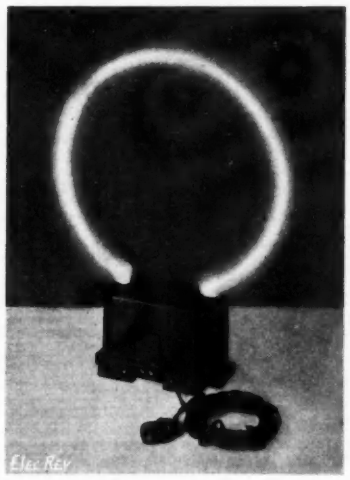
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Neon Window Sign

The new neon window-display sign made by the IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.4, has a 1-in. triple-ply opal glass tube, formed into a loop 12 in. in diameter, although distinctively formed loops can be furnished for quantity orders.

The initial cost is £3 6s. 6d., and the consumption is 1 kWh in 100 hours. The transformer is a specially designed high-grade instrument completely enclosed in the moulded base. Grained walnut is the usual finish, although others can be supplied to order. Mounting slots are provided at the back and front for inserting either rod or strip fittings to support goods and showcards. Standard transformers are supplied with three tappings, and these may be connected to a.c. lighting circuits from 200 to 250 V, 50 to 100 cycles. They can also be wound for 100/150 V, 50 to 100 cycles, without extra charge.



The Igranic neon window sign

A special safety feature costing £1 is now available to obviate completely any risk of dangerous shock from the high secondary voltage. This device is arranged to plug straight into a standard wall-pattern socket, and measures only 2½ in. by 2¾ in. "On" and "Off" push-buttons project through the cover and operate in conjunction with the automatic safety relay. If the neon tube is not in place in the base, completely covering the h.v. terminals, or if the tube should be broken, the automatic relay immediately switches off the supply current.

The "Fenbo" Crystal Lamp

We have received from the BRITISH CRYSTAL LAMP CO., 16, Northumberland Avenue, W.C.2, a sample "Fenbo" lamp. It embodies a special crystal-glass effect, the bulb being moulded in a pattern of small squares. These break up the light, giving glareless illumination and a decorative effect. The price is 1s. 11d. Lamps for all wattages and voltages can be obtained.

A Safety Handlamp

A low voltage hand-lamp has been introduced by Messrs. F. C. HEAYBERD & CO., LTD., 10, Finsbury Street, London, E.C.2. A double-wound transformer is used to secure a 12 V supply, and this is housed in a metal box and designed to be hung on a wall near the lighting point. The lamp costs 39s., and can be recommended for use in damp situations.

The Heayberd safety lamp

An Anti-dazzle Automobile Lamp

During a recent visit to the works of RIVAL LAMPS, LTD., at 230, Knight's Hill, West Norwood, London, S.E.27, we saw the manufacture of a new anti-dazzle automobile lamp which the company is introducing.

The "dipped" filament, although of the same wattage as the main central filament, is behind a specially shaped mask of white translucent paint on the glass, and is situated at a wide angle from the centre of the bulb, so that the direct rays of the "dipped" filament are shielded from the oncoming traffic.

The direct rays are prevented in the same way from reaching the base of the reflector, so that the light is not sent upwards into the face of an approaching driver. The "dipped" filament can be obtained with a wattage lower or equal to that of the main filament, or if it is desired to have a powerful "dipped" light a higher wattage may be employed.

This company, which has only been operating for a short time, is also making the standard types of bulbs, both of the single and double filament types, or with the Lucas dipping arrangement.

An Unusual Table Standard

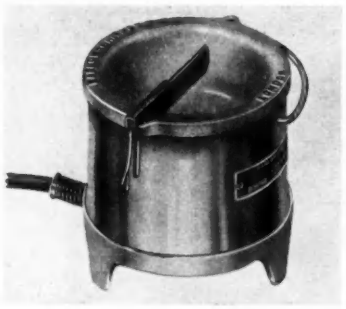
A cigarette lighter has been combined with the new table lamp being marketed by MESSRS. DRAKE & GORHAM WHOLESALE, LTD., 77, Long Acre, London, W.C.2. The base of this 37s. 6d. lamp can be obtained in walnut, oak or mahogany to suit the surrounding furniture. There is a nickel-plated chain pull-switch lampholder, a washable shade and an ash tray, which is also nickel plated. The lighter has a polished wooden handle with its own switch and rests in a clip at the side of the standard.

A novelty such as this should prove the solution of many gift difficulties during the approaching Christmas season.

A combined cigarette lighter and table lamp

An Electric Tinning Pot

The new electric tinning pot, with a capacity for 5 lb. of solder or 6 lb. of lead, which has been introduced by MESSRS. BARLOW-WHITNEY, LTD., 39, Neal Street, London, W.C.2, has been designed for tinning and soldering of small parts and cable ends, particularly in radio, telephone and similar small manufacture and assembly work, both for direct dipping of parts and for the rapid heating of small soldering irons which, when heated in this manner suffer very little oxidisation.



The Barlow-Whitney tinning pot

The pot, priced at 28s., is suitable for continuous operation without attention, the heat given off by the 300-W "Chromalox" element balancing radiation losses when the contents have reached a temperature of about 800 deg. F.

The crucible is a special high-grade casting with internal dimensions of 3½ in. (diameter) by 1½ in. (depth). All connections are brought to an easily accessible chamber in the cast iron base, and monel wire is used for connections in the heat zone.

Special features are the polished stainless-steel outer casing and scientific lagging to reduce heat losses, and scraper attachment pivoted on the rim of the crucible enabling the surface to be kept free from dross. Provision is also made for attaching a depth stop so that short wire ends can be dipped without fear of burning the insulation. For melting wax or compound the pot can be supplied with a lower loading.

An Electric Blanket

The "Warmglow" is a new electric blanket made by the WARMGLOW COMPANY, Leigh-on-Sea, Essex; it is sold by the MEDICAL SUPPLY ASSOCIATION, LTD., 167-173, Gray's Inn Road, London, W.C.1, and is a double-thickness all-wool fleecy blanket to be used as part of the bed-clothing in the usual way, not as an accessory bed-warmer which is taken out of the bed. Only a neat switch and an electric flexible cable emerging from the bottom corner distinguish the blanket from the others.

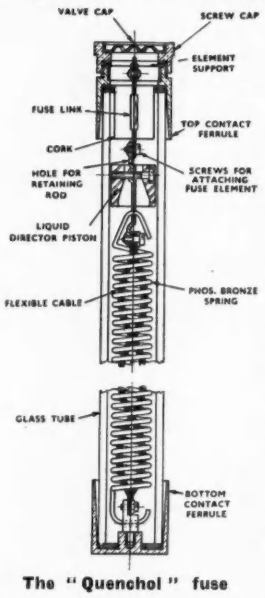
The blanket is placed in the bed next to the top sheet, flexibility being a special feature of the design. The switch should be operated an hour before going to bed, and the plug removed as soon as the occupant is in bed.

The blankets, which cost from £1 10s. to £3 5s., according to size, are supplied in white as standard, although other colours are also available.

"Quenchol" Liquid Fuses

A feature of the new high-voltage liquid fuse, known as the "Quenchol," introduced by the GENERAL ELECTRIC CO., Ltd., Magnet House, Kingsway, London, W.C.2, is the ease

and convenience of rewiring and refilling, which can be performed by the user, thus eliminating the inconvenience and expense involved in the case of fuses requiring to be returned to the factory.



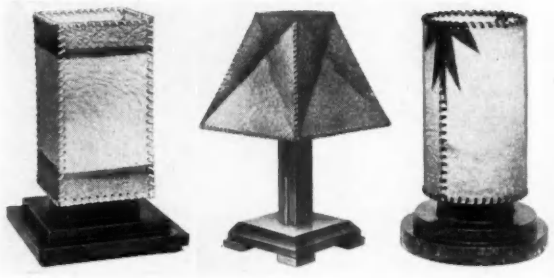
The "Quenchol" fuse

The fuses are made for all line voltages up to 66 kV, and for fusing currents from 1 to 25 A with a short element held in tension by a coil spring, the whole being contained in a glass tube filled with an insulating liquid — chlorinated hydrocarbons. When tested with a standard B.S.S. oil gap (*i.e.*, 15 mm. spheres and 4 mm. gap) breakdown takes place at 45,000 to 50,000 V, as compared with the B.S.S. minimum for oil, which is 30,000 V. "Quenchol" is claimed to be non-corrosive, considerably less volatile, and to have a low coefficient of expansion (0.000694 per deg. C. at ordinary temperatures).

The element (except for very small fuses using only one wire) consists of two short wires in parallel, the first, of relatively low resistance, being the fuse proper, and the second, being of high resistance and high-tensile strength alloy, so fixed as to take the entire tension of the spring. A surrounding cork casing confines the arc at the instant of break and prevents undue shock to the glass.

Attached to the lower end of the fuse element is a piston with a small conical hole through the centre, which, on the collapsing of the phosphor-bronze spring due to the blowing of the fuse, forces the liquid on to the arc, thus extinguishing it rapidly. The spring is secured at one end to the piston carrier and at the other to the bottom ferrule, the current being shunted from it by a flexible connection. The top ferrule is fitted with a screw-on cap into which is pressed a small valve cap of corrugated construction, which is ejected on a heavy fault, thus relieving the pressure and preventing damage to the tube.

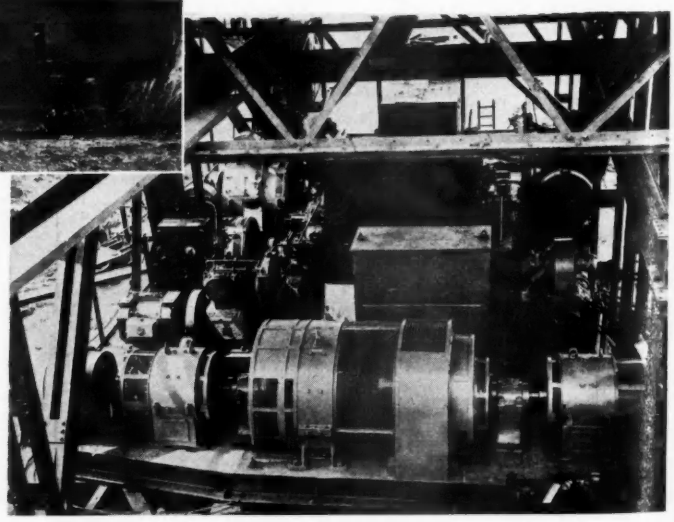
Decorative Table Standards



Three table lamps of unusual design which have recently been introduced by a new company, Furn-Art, Ltd., Sarnesfield Road, Enfield, Middlesex. Various coloured shades can be obtained and oak is used for the base

A Large Electrical Excavator

THE 9 cu. yd. shovel excavator recently installed in the new iron-ore bed at Corby, Northamptonshire, which is being opened up by Messrs. Stewarts & Lloyds, Ltd., in connection with their new tube rolling mills, was built by Messrs. Ransomes & Rapier, Ltd., and is fitted with electrical equipment manufactured by the British Thomson-Houston Co., Ltd. It weighs some 600 tons, has a dumping height of 70 ft., and a radius of 101 ft., thus enabling a cut of 55 ft. to be maintained without rehandling the deposited material.



Above: The excavator in operation at Corby. Below: The B.T.H. electrical equipment on the excavator

The excavator is electrically operated on the Ward-Leonard system, and all clutches and brakes are air-operated, the air being under the control of magnetically operated valves, which are in turn controlled from the driver's cabin. As a result, all the motions can be operated by one driver with little physical effort.

Power is supplied to the excavator at 3,300 V, 3 phase, 50 cycles, through a flexible trailing cable to a collector unit on the revolving superstructure, and thence to a high-voltage control cubicle where the a.c. divides through isolating switches, a main supply going to the auto-transformer starting switches for the synchronous motor, which drives the main motor-generator set; and an auxiliary supply going through high-voltage fuses to a 50-kVA step-down transformer supplying 440 V to the auxiliaries and lighting circuits.

The main motor-generator set comprises five machines, namely, a 435-kVA synchronous motor, a 275-kW generator for the hoist motion, two 75-kW generators for the slew and crowd motions, and a 20-kW 125-V exciter. All these machines are mounted on a welded steel baseplate, arranged for three-point support, to avoid distortion should the superstructure deflect slightly under the strains imposed during operation. The exciter supplies all the separately excited fields of the motors and generators through controllers and resistances, and also the field of the synchronous motor.

The driving units comprise twin 187-h.p. hoist motors, twin 62.5-h.p. swing motors, and a single 125-h.p. crowd motor, all forced ventilated by individual motor-driven blowers taking their power from the 440-V auxiliary supply.

The auxiliary equipment comprises a motor-driven air compressor arranged to start and stop automatically, depending on the air pressure in the receiver. A friction hoist fitted on the boom is driven by an 8-h.p. squirrel cage motor controlled by a direct-on-line contactor starter; and a dipper trip motor is operated from the 125-V d.c. supply through a contactor controlled by a latch operated push-button fitted on the crowd controller lever gear.

Window Dressing to Attract Business. By W. Jervis

Practical hints on planning and arrangement

IT is quite possible to arrange attractive window displays without the expenditure of a lot of money. At first thought electrical apparatus does not appear to lend itself so readily to original display as do foodstuffs, haberdashery, etc., but when a proper study of the subject is made it is astonishing how ideas arise, and how many and varied displays may be arranged at very small cost and with the minimum of effort.

A showroom or shop window represents the expenditure of capital, and it should be made to pay a dividend, or at least meet the interest on the amount involved.

In the first place the nature of the display is determined by the needs of the moment in the sense that the intention may be to introduce a new piece of apparatus, or to increase the sales of some particular appliance. Again it may be concerned with what is known in sales parlance as "selling the idea," or in other words conveying a message to the public without actually showing any apparatus. The latter kind of display gives ample scope to well-conceived ideas.

With the subject in mind, the display must be planned. The filling of windows to capacity with apparatus or decorative effects should be avoided at all costs. Too many window designers and dressers fall into this error and the general public, having too much to look at, fail to remember afterwards the very thing which is being advertised. It is preferable to have too little in the window than too much.

There are many considerations to be taken into account in connection with a really attractive display, each one with its own peculiar importance, and in my opinion the following points should always have special attention:—Originality, topicality, interest, humour, season, good showcards, neatness, and efficient dressing.

Mr. W. Jervis is a sales engineer with the North Metropolitan Electric Power Supply Co.

Originality and Interest

The original display always creates the most interest, and having done so gives the window a chance to carry out its "silent salesmanship." One need not be a genius or an expert to arrange a succession of original window displays. During journeys in train, tram or bus, if a "display" interest is taken in the surroundings, a surprising number of suggestions come to mind, which appropriately altered and adapted may be arranged into quite original windows.

For example, a recent window show that I planned consisted of a clothes horse on which was a washed and ironed shirt. The only message conveyed to the public by showcards consisted of a few words as follows:—"This is the only horse you should put your shirt on." "If it's washed and ironed electrically, it's a Cert."

This display was original, and as it coincided with the Grand National Steeplechase it was topical. The resultant effect on business during the display was astonishing in connection with the sales of irons and wash-boilers.

Ideas come during conversations, watching cinema pictures, and in all kinds of unexpected places. Far from bringing one to that unhappy state where business is always in mind, this idea actually makes life a little more interesting. It has been my experience that to sit down and think out a really good display is much more difficult than to train the mind to be receptive to more or less subconscious suggestion.

There is a strange fascination in this "game" after a little while, and it is certainly a very profitable source of really "telling" displays requiring a minimum of effort.

Topicality

With regard to the necessity for displays to be topical, if a special item of news, a big sports week, Derby week, or anything of this nature occurs, the public are naturally constantly discussing it, or in any case the subject is fresh in their minds, therefore they must be already receptive to anything relating to this particular occasion. It is advisable, however, to avoid direct reference to the subject. It should be hinted at or mentioned in a roundabout, but not too obscure, way. The public like to have the satisfaction of solving for themselves a fairly easy puzzle.

Where there is apparently nothing topical at the moment "interest" becomes more than ever a major consideration. Women are nearly always interested in domestic matters, colour and neatness of display, children in bright lights, and men in skilful arrangement of apparatus, and the cost of things, in so far as it may affect their own pockets. All these should be considered in planning the display from the interest standpoint. People must be compelled to stay for a moment at least to take in the essential details of the display.

The Careful Use of Humour

When I suggest that humour should be an ingredient I do not mean that the display should be "funny"; a certain dignity must be preserved as befitting the company's activities, but humour, introduced in a subtle, but at the same time more or less easily apparent manner, goes a long way in helping to build a really attractive window display. A window that draws a smile from the passer-by creates a friendly and receptive atmosphere. It also has, in my experience, the effect of making customers watch for subsequent displays, and almost certainly one of these displays will persuade them to purchase some apparatus.

A recent display had the immediate effect of creating sales for electric irons during a usually dull period of the year. A replica of a prison cell was built in skeleton in the centre of the window, brown crêpe paper completing the walls of the cell. Behind the black paper "bars" an electric iron was seen, a padlock on the door prominently showing. Two showcards were used, reading as follows:—"Five years hard labour is the least you may expect of an electric iron." "Give one a trial and judge for yourself." The increase in iron sales was so marked that the display was removed at the end of the fortnight with real regret.

Due regard must be paid to the time of the year. For example, heating apparatus should, of course, not be shown during the hot summer months. Every opportunity should be taken of the particular season of the year to bring to customers' notice the many aids to health and comfort particularly applicable.

Showcards are of the utmost importance in completing a display. It is not necessary to expend a large amount of money in this direction, as well-written paper showbills in attractive colours are obtainable at prices from 1s. 6d. An excellent method of ensuring neatness with showbills of this description is to make frames with removable plywood backs on which the showbills may be pasted and afterwards removed for the next display. If fixed to the background with a screw from behind the frames appear quite handsome.

Above all, showcards must convey messages or explanations with a minimum of words, keep strictly to the point, and make reference to the window indirectly but with a direct meaning. Two cards are usually sufficient; more take up too much space.

Neatness in the arrangement of a display is a very important point. A well-dressed window, like a well-dressed man or woman, commands attention. People look for faults, and, if they fail to find any, have greater regard for the display. Attention should be paid to small details, such as seeing that price tickets are arranged with the figures facing the public, and that apparatus is kept clean and fresh.

Planning and Dressing

Knowledge of the art of window dressing is essential, colour blending or contrasting information is necessary, and workmanship should be of the very best. The nature of the display has to be carefully considered before arranging the background. The position of or shape of the background should be altered from time to time; this is quite an inexpensive matter, usually done by means of cheap battens. Crêpe paper, if used, should be carefully put up and securely fixed, and with the many booklets on the subject of decorative art one need never be at a loss for new backgrounds. The apparatus should be arranged in the most favourable positions, prominence being given, of course, to the article to which it is desired to draw attention. There should always be a means of access to the window to enable the display to be cleaned and kept in fresh condition.

In conclusion, I would advise that all window-dressing ideas should first be put on paper. Coloured pencils are cheap, and a sufficient knowledge of drawing is usually latent or can be quickly acquired by a little practice. The display should be sketched as it appears in one's mind; it can then be amended and improved as thought necessary, and afterwards coloured as one wishes to see it reproduced. This naturally takes a little time, but there is the satisfaction of seeing an actual creation which gives a sense of pride in one's work.

Notes from Canada.

By our Toronto Correspondent

SHORTLY before Mr. Hoover was succeeded as President of the United States by Mr. Roosevelt, representatives of the Government of that country and of the (Conservative) Government of Canada signed an agreement regarding the development, for power and navigation, of the international section of the great St. Lawrence River, but before this treaty can have any force it has to be ratified by Congress and Parliament respectively.

So far as the development of power is concerned the Dominion Government conceded the right of the province of Ontario to this and an agreement between the Dominion and Provincial Governments was drawn up regarding the work of power development and allocating the share of cost which should be borne by each of these two governments. This agreement was not ratified, being left over until the treaty between the United States and Canadian Governments was ratified.

Mr. Roosevelt attempted to get Congress to ratify the treaty soon after he took office but the opposition to it was too strong. The newspapers are reporting that he is to make another attempt and indicate that this time he expects to succeed.

Since the first attempt was made the situation in Ontario has changed, for, whereas, then, a Conservative Government was in power in the province, a Liberal Government now holds the reins. The latter, judging from emphatic statements reported recently to have been made by the Premier, is not prepared to ratify the agreement (mentioned above) between the province and the Dominion.

It would seem that this new attitude in Ontario may block or seriously delay action with regard to this proposed development even if the Governments in Canada and the U.S.A. both ratify the Treaty.

The Hydro-Electric Power Commission of Ontario has entered, within the last few years, into contracts for the purchase of large blocks of power from some of the large hydro-electric power companies in Quebec, and it is known that there is at present a considerable surplus of power. The existence of this surplus, according to the newspapers, is the reason which the present Premier of Ontario gives for being unwilling to ratify the agreement with the Dominion Government.

Rural Supplies

In order to extend the use of electric power in rural districts the Commission is reducing the period for which contracts for power have to be made by farmers from twenty years to five years and is to make appreciable reductions in the rates charged for power used for certain specified services such as water pumping. It has been reported that for pumping water used for baths, washing machines, &c., for operating radio sets and milk-cooling machines, power will be supplied at a merely nominal figure.

In addition to reducing the rates for power the Commission apparently intends to supply farmers with electrically driven cream separators and milk coolers on the deferred payment plan.

The late Commission planned to build a large new seventeen-storey office building and a few weeks before the members went out of office contracts were let for a good portion of the work and the foundations were started. The new Commission immediately stopped the work but has since resumed it, although now it is intended only to build six or seven stories.

A Lighting Campaign

According to *Electrical News* and *Engineering* (Toronto) the Illuminating Engineering Society in its campaign for "Better Light—Better Sight," has designed a new style of table lamp and will permit all manufacturers making lamps to this design to utilise a tag "certificate" of the Society. Previously a study lamp designed in the interests of students had been made available to the public. This appears to be an excellent idea capable of extension in many directions—a great deal of lighting may be lighting but it is far from being good illumination.

Electrical Conditions in Portugal

THE trade returns of Portugal for 1933 show an increase in imports as compared with the previous year, while exports also improved slightly, according to a report on economic conditions in Portugal, prepared for the Department of Overseas Trade by Mr. A. H. W. King, Commercial Secretary, H.M. Embassy, Lisbon (Stationery Office 2s. 6d. net). This improvement, if not substantial, is accepted as an indication that the worst is over, and the conviction is growing that conditions are in process of becoming easier.

The report contains little relating to the electrical trade, the radio branch apparently being the only one of any importance. The market for receiving sets is an expanding one, but United States manufacturers continue to dominate the market. Imports suffered a considerable decline in 1932, due to overstocking by dealers and the heavy appreciation of the dollar during that year. There was a recovery in 1933, however, and the trade should receive a fresh stimulus by the opening of the new 20-kW Government broadcasting station, the transmitting plant for which was manufactured by a United Kingdom firm.

United Kingdom manufacturers have so far met with little success in this market; the obstacle of price has to some extent been removed, but up to the present no set of United Kingdom manufacture has succeeded in displacing in popular favour the Continental or American makes.

The following table shows the imports of electro-technical machinery and apparatus for the years 1932 and 1933.

	1932.		1933.	
	100 kg.	1,000 Escudos.	100 kg.	1,000 Escudos.
Generators, motors, etc. ...	2,305	6,869	3,721	7,744
Lamps...	890	8,901	1,507	12,898
Insulated wire	8,042	12,746	6,474	8,025

Dealing with the electricity supply industry the report states that, according to statistics furnished by the Portuguese Department of Hydraulic and Electrical Services, there was at the end of 1933 a total of 569 generating stations with a total installed capacity of 206,998 kW. Of these, eighty-six, representing 53,614 kW, were hydro-electric and 483 plants (153,384 kW) were operated either by steam or internal-combustion engines. The total output of electricity during 1933 is given as 302,046,989 kWh, of which hydro-electric plants were responsible for 97,541,416 kWh, and other stations for 204,505,573 kWh.

The two principal undertakings are the Companhia Reunidas Gaz e Electricidade, of Lisbon, with an output in 1933 of 76,536,185 kWh, and the Electrica do Lima e Uniao Electrica Portuguesa, of Oporto, with 65,416,767 kWh. As compared with the 1932 production the total output during 1933 showed an increase of 5.1 per cent.

As regards distribution there are now 1,999 miles of h.p. lines in Portugal, of which 1,738 miles are overhead and the remainder underground. Nothing has yet been done to develop the water power of the River Douro, regarding which a convention was signed between Spain and Portugal in 1927. It is estimated that the potential hydro-electric power in the country amounts to about 1,800,000 h.p., of which about 450,000 h.p. could be utilised in a permanent form. Electrification schemes are, however, at present engaging the Government's attention, and there are indications that laws and regulations governing the whole subject will shortly be promulgated.

The telephone services in Lisbon and Oporto are operated by the Anglo-Portuguese Telephone Co., Ltd., and at the end of 1933 there were 26,839 telephones in Lisbon and 9,341 in Oporto, an increase of 2,700 over the previous year. Posts and Telegraphs and the telephone system in the provinces are owned and operated by the Government. It is the Government's intention to bring the State network up to date by the introduction of automatic equipment on a large scale and, at the same time, to modernise the telegraph system. The number of telephone subscribers in the provinces at the end of 1933 was about 10,000 in 350 towns and villages.

Electric Tar-boilers

Excessive temperature of tar or bitumen in the preparation of macadam upsets the composition, while too low a temperature (*e.g.*, 200 instead of 240 deg. F.) may cause the waste of a gallon of tar for every ton of stone. In a new E.D.A. publication (illus.) entitled "Tar Heating," which is No. 1 of an "Electric Heat" series, it is stated that the thermostatically controlled electric boilers now available (which consist of rectangular tanks at the foot of which are placed the heating elements) will hold the temperature at any value up to 450 deg. F. The low temperature of the elements precludes the risk of fire and enables the tar to be heated without attendance during the night so as to be ready for work the first thing in the morning. A common-size boiler has a capacity of 1,500 gal. and is rated at 36 kW, but boilers up to 3,000 gal. are available. Users have shown satisfaction by ordering additional boilers; in one case an unlagged storage tank with a capacity of 6,000 gal. is used in conjunction with a lagged 1,500-gal. boiler; electric heaters for occasional use are installed over the output valve of the storage tank. This equipment dealt with over 80,000 gal. of tar in eight months.

In the Courts

IN the King's Bench Division on November 12th Mr. Justice Hawke and a common jury had before them an action brought by Mrs. Harriett Pearce, of Mitcham, against the County of London Electric Supply Co., Ltd., and the Urban District Council of Mitcham (now the Mitcham Borough Council), for damages for personal injuries she sustained on November 2nd, 1932, whilst walking on the footway in Western Road, Mitcham.

Mrs. Pearce alleged that when she was passing an electric inspection box, the property of the first defendants, her left foot sank into loose earth in the footway which by the negligence of the defendants, or of one of them, had been left in a defective and dangerous condition, with the result that the plaintiff fell and sustained a fractured right arm and suffered concussion, shock and other bodily injuries which had caused her a loss of earnings.

The County of London Electric Supply Co. denied liability and negligence, and stated that at the time of the accident the local authority had completed some part of the work of reinstatement.

The defence of the local authority was a denial of any negligence on their part and they said that the plaintiff had herself been guilty of contributory negligence.

At the conclusion of the evidence and the arguments of Counsel on November 13th the jury returned a verdict for the plaintiff for £400 damages. His Lordship said he would give judgment in a few days as to which of the sets of defendants were liable or whether both were liable.

Consultants' Claim for Fees

In the King's Bench Division on November 12th Mr. Justice Goddard had before him the case of Handcock and Dykes and the Leatherhead and District Electricity Co., Ltd., the case coming before his Lordship on a special case stated by Mr. S. R. C. Bosanquet, K.C., the Official Referee, who in the present case, which was an arbitration between the parties, sat as arbitrator. In his award Mr. Bosanquet said that by an agreement made on March 19th, 1928, Messrs. Handcock and Dykes were appointed for a period of ten years consulting engineers.

In June, 1930, the Leatherhead Company's undertaking was sold to the County of London Electric Supply Co. and on December 16th, 1930, the undertaking was resold to the London and Home Counties Joint Electricity Authority. It was a term of each of the agreements whereby such sales were effected that the purchasers in each case should assume the burden and the benefit of all contracts entered into with the Leatherhead and District Electricity Co. prior to the agreement of March 19th, 1928. In January, 1931, Mr. A. H. Dykes, a partner in the firm, was informed by the chairman of the Joint Electricity Authority that the services of the firm would be no longer required by the Authority. Subsequently to January, 1931, Messrs. Handcock and Dykes made a claim upon the Joint Authority that they were entitled under the agreement of March, 1928, to receive a commission of 5 per cent. upon all constructional work undertaken by the Authority within the district covered by the company's undertaking. That claim was resisted and in October, 1932, Mr. Justice Luxmoore gave judgment for the Authority and the Court of Appeal on February 16th, 1933, affirmed this decision.

On March 31st, 1933, a claim was made by Messrs. Handcock and Dykes against the Leatherhead and District Electricity Co. for payment of sums amounting in all to £1,981 for work done between January, 1928, and January, 1931, and it was this matter which was referred to Mr. Bosanquet as arbitrator, who held that the work particularised was in fact carried out by Messrs. Handcock and Dykes, and that the charges made were fair and reasonable. For the company it was contended that apart from an annual fee of 200 guineas Messrs. Handcock and Dykes were entitled to be paid nothing in respect of the work detailed. It was further contended that by presenting the accounts dated April, 1929, and April, 1930, Messrs. Handcock and Dykes were estopped from claiming any remuneration for the work set out in the particulars of claim apart from the amounts which they received in payment of such accounts.

The question now raised for the opinion of the High Court was whether the contentions raised by the Leatherhead Co. were correct in law.

At the conclusion of the arguments on November 13th his Lordship, on the findings of the arbitrator, Mr. Bosanquet, held that Messrs. Handcock and Dykes were entitled to the sum they claimed and gave judgment for them for the amount —£1,981 7s., with the costs of and incidental to the arbitration, and also the further costs in that Court.

Radio Relay System Tapped

For "abstracting and using electricity to the value of 1s. 6d. the property of the Hampshire Electrical Co.," by tapping the company's radio relay system, Violet Maud Olden, 2, Market Row, Gosport, was fined 10s., plus a further 10s. with £2 2s. costs for not having a licence for her receiving set, at Gosport Police Court recently.

Parliamentary News (BY OUR SPECIAL REPORTER)

ON November 7th the Prime Minister announced that Parliament would be prorogued on Friday, November 16th, and the new Session would begin on Tuesday, November 20th. He said that no time had been allowed for the Electricity (Supply) Bill (Lords) during the current Session. The Bill would be introduced at the beginning of the new Session and passed into law as expeditiously as possible. He could not agree to the Bill going to a Select Committee.

Smoke Abatement

On November 7th Mr. Hannon asked the Minister of Transport when the report of the Government Chemists' Committee on the measures adopted for the purification of smoke emitted by the power stations recently erected in the Greater London area would be presented to Parliament.

Mr. Hore-Belisha said that the Committee had recently made a further report and he expected that it would be published shortly.

L.N.E.R. Electrification Again

On November 12th Mr. Cadogan asked the Minister of Transport whether he had considered the petition from the Councils of the boroughs of Finchley, Hornsey, and Hendon, and the Urban District Councils of Barnet, East Barnet Valley, Friern Barnet, and Wood Green, advocating the immediate electrification of that part of the system of the London and North-Eastern Railway which served the areas of these local authorities; whether he had referred the petition for consideration to the Railway Company and the London Passenger Transport Board; and, if so, whether he could give any information as to their replies.

Mr. Hore-Belisha said that the answer to the first two parts of the question was in the affirmative. As regarded the third part, he was informed that the Standing Joint Committee of the Main Line Railway Companies and the London Passenger Transport Board had decided that a scheme for the electrification of the Great Eastern suburban lines based on Liverpool Street would take priority over a scheme for electrifying the lines radiating from King's Cross, but these matters were not in any way under his control.

Electric Lamp Imports

On November 12th Mr. H. Williams asked the President of the Board of Trade if he was now prepared to amplify the statement issued by him to the Press on August 28th last as to the decision not to give effect to the recommendations of the Import Duties Advisory Committee in respect of the additional duties on complete electric lamps; and if he could indicate what concessions were obtained from Japan as a result of the decision not to give effect to the recommendations of the Import Duties Advisory Committee.

Mr. Runciman said that no question of a concession from Japan arose in this connection. The imposition of higher duties on imported electric lamps had been suspended so long as the desired limitation of imports was obtained in some other way.

New Books

"Technical and Scientific Encyclopædia." Edited by C. F. Tweney and I. P. Shirshou. Pp. 48; figs. London: Hutchinson & Co. (Publishers), Ltd. Price 1s. 6d.—This encyclopædia is to be produced in about forty weekly parts, and the first number has recently been published. It is claimed to be the only new work of its kind for a quarter of a century. Developments that have taken place in almost every branch of science during this period justify the appearance of such a work, which, so far as we can judge from the initial part, seems likely to provide a most useful source of reference.

"Chemistry in Commerce." Edited by E. Molloy and M. D. Curwen. Pp. 56; illus. London: George Newnes, Ltd.—This is the first of about thirty-two weekly numbers (1s. each) designed to form a volume that covers the field of the practical applications of chemistry. The part before us consists mainly of a number of technical articles written by authorities in the various branches. No specific reference is made to electricity, but possibly it is regarded as all pervasive, since, for example, in an article on synthetic ammonia mention is made of the part played by electricity in its production, and there is also a note on electrostatic precipitation.

"Punch" Almanack for 1935 has just come to hand, and Mr. Punch is in his usual good form. The publication contains sixteen pages in colour and twenty-three of black-and-white drawings. It forms a pleasant reminder of the approach of the festive season.

"Neon," by S. Gold. Pp. 178; figs. 17. London: Crosby, Lockwood & Son. Price 7s. 6d.

"Radio Round the World," by A. W. Haslett. Pp. 196; figs. 22. London: Cambridge University Press. Price 5s.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures

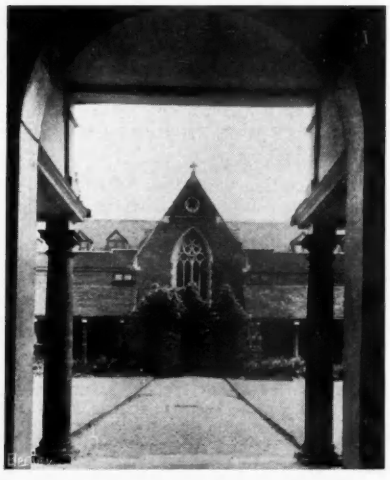
Safety in Electrical Installations

About 200 Manchester electrical contractors and a number of officials of the Manchester Corporation Electricity Department attended a meeting at the Athenæum, Manchester, on November 7th, to hear an address by Mr. L. H. Marlor, chief electrical installation engineer, on the subject of "Safety First in relation to Electrical Installations." This is the first time that the contractors of the city have had the opportunity of discussing in public, with officials of the Department, matters of mutual interest. The meeting was held under the auspices of the Manchester branch of the Electrical Contractors' Association.

In the discussion particular attention was directed to the sale by Manchester stores of electrical apparatus which did not conform to a high standard of safety, and in this connection some electric fires of the portable type were shown. Mr. Marlor mentioned that Mr. H. C. Lamb, the chief engineer and manager, had obtained a number of these appliances which had been purchased locally and the matter was having his serious consideration. Some time ago, when it was observed that a local establishment was offering fires which did not conform to the desired standard, representations were made which resulted in their withdrawal. Mr. A. E. Jepson proposed that there should be established a national proving house to which all electrical apparatus should be submitted. If that were done it would be the means of preventing unsatisfactory apparatus being put on the mains. Mr. Marlor stated that thirty-five years ago Manchester Corporation had such an establishment, but it became unwieldy and was discontinued because it was thought that the work should be done by a national testing house.

The Wiring of an Ancient Building

The Reigate branch of Messrs. G. Weeks & Sons, Ltd., 204, High Street, Bromley, has recently carried out an interesting installation at Bromley College, a charming seventeenth-century building and the oldest and largest foundation in the country for "the relief and honourable retirement of widows and daughters of clergymen of the Church of England." In executing the wiring it was necessary to pay special attention to the concealment of the cables. This work was rendered more difficult because one floor had been laid on the top of the old floor and numerous floors existed of very old oak boards, in some cases up to 18 in. wide by 1½ in. thick. A number of the beams encountered were as much as 15 in. square and, to preserve the beauty of this old timber, extra cable was used to avoid cutting them. Over 6,000 yds. of Henley wiring-system cable was used for this installation and about 200 joint boxes fitted, together with numerous other accessories of Henley's manufacture. Branch switches and main switches and fuses of Crabtree manufacture, M.E.M. distribution boards, and M.W. switch-plugs were used for the 682 lighting points in the houses. The lighting for the cloisters and outside of the buildings consisted of thirteen points, and special fittings were made for the whole of these to harmonise with the surroundings. G.E.C. fittings were used for the floodlighting of the interior of the chapel.



Bromley College, which has recently been wired with Henley cable

The F.B.I. Business Forecast

The "Business Forecast" published in the Federation of British Industries' "Business Barometer" states that the recovery of British trade has reached a condition which may be described as the "prosperity phase" of a short-run business cycle. This is the phase in which new investment and industries make headway; it is also the phase in which over-acceleration in existing investment and industries is liable to produce conditions which induce a recession. It is therefore a time for the exercise of prudence and restraint; a time when it is often wiser to put off till to-morrow the manufacture of the goods which, by increasing the speed of production, might equally well be produced to-day. The need for urging caution at the present stage is reinforced by the trend of development overseas. Uncertainty and doubt are once again in charge of the United States business outlook. On the Continent of Europe conditions are equally unsettled. The serious endeavours being made by the gold *bloc* to arrive at a common accord for mutual defence and support are dictated more by fears of a further depreciation of the U.S. dollar than by purely commercial considerations. Similarly, Dr. Schacht's policy for making Germany self-sufficient in raw materials is in a large measure dictated by a pessimistic view of the international situation.

The Industrial Welfare Society

The annual dinner of the Industrial Welfare Society will be held on December 11th at the May Fair Hotel, W., when the Duke of York will preside. Particulars can be obtained from the secretary of the Society, 14, Hobart Place, S.W.1.

German Conductor Wire Syndicate

It is announced that the German Conductor Wire Syndicate and twelve outside firms have entered into an agreement under which the latter have undertaken to observe the prices and discounts fixed by the former for a period of six months. A controlling office has been set up to supervise the market.

Irish Free State Electrical Imports

A more active state of affairs again prevailed in the electrical trade in the Irish Free State during September last, the month's imports of electrical machinery and cognate material having attained a value of £91,064, as against £61,788 in September, 1933. The appended table shows the aggregate imports during the first nine months of the current year, from which it will be seen that, despite a decline in the imports of radio material and unclassified electrical goods, the total amounted to £620,742, an increase of £74,259 over the corresponding period of 1933.

	January–September. 1933.	1934.
	£	£
Electrical machinery	162,288	227,634
Electric wires and cables...	45,102	67,766
Electric lighting accessories, fittings and parts...	28,679	35,884
Radio sets and parts	138,426	121,324
Other electrical goods	171,988	168,134
Totals	£546,483	£620,742

New "Northmet" Showrooms

The North Metropolitan Electric Power Supply Co. was to open new showrooms on Wednesday last at Enfield and yesterday (Thursday) at St. Albans.

New Electricity Showrooms at Spalding

Speaking at Spalding (Lincs) on November 6th when he opened the new offices and showrooms of the Spalding Urban District Council's Electricity Department, the Lord Mayor of Bradford (Capt. A. W. Brown) said that electricity, as an industry, was the only industry to maintain its place in this country during the past ten to fifteen years, and industry, generally, was relying more and more on electricity for its power and success. While Spalding wanted to maintain its Electricity Department on a sound financial footing it should give consumers returns in the form of reduced charges and increased facilities as the undertaking expanded.

Textile Mill Electrification

A 4,000-kW turbo-alternator recently installed by the Metropolitan-Vickers Electrical Co., Ltd., at the textile mills of Salts, Ltd., Saltaire, near Bradford, was formally inaugurated on November 10th by Miss May Guild, daughter of Mr. R. W. Guild, managing director of the company. The set is to generate power for 500 motors (ranging from 1 to 200 h.p.), which drive the mill machinery and to supply electricity for the lighting system (6,000 lamps). The new plant, with the necessary switchgear, &c., also supplied by Metropolitan-Vickers, completes the electrification of the Saltaire Mills, displacing seven steam engines.

The N.W. District Council

The annual meeting of the District Council (No. 3) (North-Western Area) Electricity Supply Industry was held at the new offices of the Council on November 8th, and the employers entertained the trade union members to lunch at the Engineers' Club, Manchester. Ald. Sir Thomas Higham presided and welcomed as guests Messrs. R. Blackmore, J. T. Watkins, and C. E. Ross, three of the "founder" members. He specially welcomed Mr. J. Rowan, who attended for the first time in his capacity as chairman of the National Council, and Mr. T. K. Liddell, the Area conciliation officer for the Ministry of Labour. He extended to the trade unions an invitation to make use of the committee room at the new offices in connec-

tion with the work of the District Council. Mr. Rowan replied for the guests, and said that the reports the National Council received in London from time to time rather belied the pleasant social atmosphere which was now evident. He believed the social meetings of both sides, as on this occasion, were part of the scheme which contributed to the success of the Council. Coun. J. Gorman, the vice-chairman of the District Council, proposed a vote of thanks to Sir Thomas Higham, and for the employers' offer of facilities for their meetings.

French Domestic Electrical Imports and Exports

The appended table shows the French imports and exports of domestic electrical appliances during the six months ending with June last as compared with the corresponding period of last year. It will be seen that both sections of the trade show a considerable expansion.

	Imports. Jan.–June,		Exports. Jan.–June,	
	1933.	1934.	1933.	1934.
	1,000 Fr.	1,000 Fr.	1,000 Fr.	1,000 Fr.
Electric fires and stoves	2,021	2,285	1,430	1,153
Electric irons	68	81	113	90
Electric vacuum cleaners, boot cleaners, etc.	1,995	2,752	2,887	4,462
Electric refrigerating machines, etc....	1,922	7,775		
Electric fans	499	623		
Total fr.	6,505,000	13,516,000	4,430,000	5,705,000
Total at 75 fr. to £	£86,730	£180,215	£59,065	£76,065

The chief feature of the import side is the noteworthy increase in the imports of refrigerators. As regard the exports it will be seen that there was a slight falling off in fires and irons which was, however, more than counterbalanced by the advance shown in the other items.

Local Exhibition

A three-day electrical exhibition arranged by the Sutton Coldfield Corporation Electricity Department in conjunction with the British Electrical Development Association was opened on November 5th by the Mayor (Mr. A. E. Terry). The exhibition, which covered every phase of electrical development from the domestic point of view, was organised by Mr. T. Bloore, borough electrical engineer, who secured the support of the leading manufacturers of electric fires, radiators, storage water heaters, cookers, washing machines, radio equipment, and a variety of electrical accessories. The Electrical Association for Women was represented by a well-equipped stand at which addresses by experts were given on the economic advantages of the use of electrical equipment in the home.

A Bulgarian Lamp Company

It is reported that a company known as the Belfa has been experimenting for some time past with the manufacture of electric incandescent lamps in Bulgaria and that arrangements are now being made to commence production on a commercial scale at works at Sliwen.

New Ferranti Radiograms

Messrs. Ferranti, Ltd., inform us that following recent announcements introducing their radiogramophones, the demand has already exceeded expectations, but production is

Inspecting Ferranti radiograms before dispatch

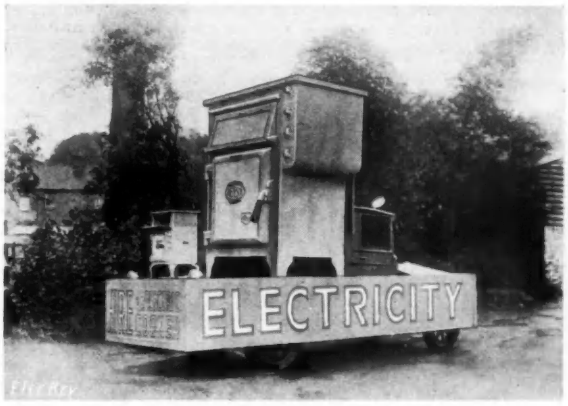
increasing rapidly and these instruments are being dispatched regularly. Our picture shows some of these radiograms undergoing final inspection before packing and dispatch.

A Model Scottish Bakery

The new all-electric bakery which has been erected in Freeland Place by the Kirkintilloch Co-operative Society has cost £10,000. The flour is brought up to the top of the building by means of an electrically driven sack hoist. It is fed into a machine that blends and sifts it automatically, and is then passed to a weighing machine downstairs, which is electrically controlled and gives automatically any weight of flour desired. The weighing machine travels on overhead rails, so that the flour may be taken to the stirring or kneading machines as desired. Thence the dough goes to the divider, a machine which cuts it up into the correct weight for 2-lb. loaves, after which it is passed to a second machine, which kneads it up and passes it to the table ready for shaping for the ovens. There are three of these, of the draw-plate type, each capable of baking 480 2-lb. loaves at a time. Besides the bread section, part of the bakery is devoted to confectionery, and here are arranged cake machines, egg whisks, pastry brakes, etc., for the making of cream and fancy goods, with two ovens of the Peel type. The bakery is equipped with the latest type of electric pie- and tart-making machine, an electric doughnut fryer, hot-plates for making icing sugar, and each machine has its own electric motor. The entire bakery has been fitted throughout with ovens and machinery by Messrs. Melvin & Gillespie, Ltd., Glasgow.

A Carnival Lorry

The accompanying illustration shows a lorry entered by the Chesham Electric Light & Power Co., Ltd., in a local hospital carnival held recently. The two cookers of contrasting sizes



An electrical entry in the recent Chesham Carnival

were intended to show that the company caters for the small as well as the large consumer. The lorry was floodlighted by means of headlights.

Social Events

Callender's Social Club Dramatic Society will render "A Damsel in Distress" at King George's Hall, London, W.C.1, on December 4th. Tickets may be obtained by 'phoning Mr. Baber, "North 0623 (Extension 6).

As a result of the two performances of "A Murder has been Arranged," which were given recently at the Fortune Theatre by the G.E.C. Dramatic Society, a donation of £58 has been forwarded to the Electrical Trades Commercial Travellers' Association Charities.

The Leicester and County Electrical Club held its second annual ladies' night at the Grand Hotel, Leicester, on November 2nd. The guests, numbering nearly two hundred, were received by the president of the club and his wife, Mr. and Mrs. J. Mould. The dinner menu was amusingly written in electrical terms. During dinner Mr. J. Orringe proposed the toast of the ladies, to which Mrs. Mould responded. After dinner there was dancing in the King's Hall, Mr. A. Baillie acting as M.C.

Freezing Foundations

The most recent example of the laying of foundations without disturbance to an existing structure or interfering with normal business is provided by the extension of Messrs. Bentall's premises in Kingston-on-Thames. The present building rests on 15 ft. of "Thames ballast," a gravel and sand formation containing 12 ft. of water overlying the clay beneath. To prevent movement, the gravel under the footings has been solidified into artificial sandstone by the Joosten chemical consolidation process which has been introduced into this country by Edmund Nuttall Sons & Co., John Mowlem & Co. (Joint), Ltd., and Siemens-Schuckert (Great Britain), Ltd. Thus the ground under the existing walls is undisturbed when the new foundation pits are dug. The process is also being used in making arches of solid ground when driving escalator tunnels.

The "Normandie"

It has been decided that the *Normandie*, which is now approaching completion at St. Nazaire, shall be the first large French liner to have her four propellers driven by separate electric motors, deriving power from high-speed steam turbo-alternators. The vessel, which has a length of 1,030 ft. and a tonnage of 75,000, is being equipped by the Alsthom Co., of Belfort, with four steam turbines directly coupled to 33,400-kW three-phase a.c. alternators generating at 5,500-6,000 V and 2,430 r.p.m., the battery of twenty-nine Penhoet boilers operating at 500 lb. per sq. in. Power will be transmitted by single-coil cables at frequencies ranging between 60 and 81 cycles per second to the four motors, each designed to develop 40,000 h.p. at 243 r.p.m. Under normal conditions they will operate synchronously, but they are designed to act on starting and up to a fourth of their normal speed as asynchronous machines. It will be possible to run them asynchronously at higher speeds, but only for very short periods.

Domestic Refrigerators in Germany

According to estimates prepared by A. Friedrich and reproduced in *Elektrotechnische Zeitschrift*, there are about 80,000 electric refrigerators in domestic service in Germany, consuming about 30 million kWh per annum. If the same level of utilisation were attained as in the United States there would be about 2½ million refrigerators in Germany consuming nearly 1,000 million kWh per annum. Such a development would serve the double purpose of providing employment and reducing the waste of food. The author considers that electric refrigerators compete economically with other types, provided that the cost of energy does not exceed 15-20 pf. per kWh (about 1¾d. to 2¼d. at par) for compression refrigerators, or 5 pf. (0.56d.) for absorption refrigerators. A storage box opening at the top, instead of at the side, enables the refrigerator to be opened without losing all the cold air.

Electricity for Cement Works

At a recent meeting of the Clitheroe Town Council, Ald. J. Boothman, chairman of the Electricity Committee, confirmed the report that a large firm of cement manufacturers intended to build a modern factory at Clitheroe. They would employ

The stand of Sheffield Corporation Electricity Department at the recent Ideal Homes Exhibition held in that city

over 100 men, the works would be electrically driven, and the annual consumption was expected to be nearly 4,000,000 kWh, which was more than twice as much as the whole undertaking supplied at present.

Modern Street Lighting

A handbook for public lighting authorities has been issued by E.D.A. to supplement its previous publication known as "Your Streets by Night." The new booklet called "Up-to date Practice in Street Lighting" illustrates a large number of installations and shows that during last year an additional 1,000 miles of public streets were illuminated by electricity, of which half were changed from gas. Other subjects dealt with include the practical application of the British Standard Specification and the light output of both electricity and gas lamps.

Italian Electrical Trade

A recent return shows that, taking the Italian lire at 57½ to the £, the imports of electrical machinery and apparatus into Italy during the seven months ending with July last attained a value of £988,485 as compared with £1,105,510 in the corresponding seven months a year ago. During the same period there was also a decrease in the exports of similar material from Italy, from £424,440 to £399,625.

Ironmongers and Electrical Sales

Mr. T. T. Colley addressed members of the Liverpool Ironmongers' Association on November 8th on the proposal to form an electrical section of the Ironmongers' Federation. He claimed that the ironmonger was the first man to participate in the distribution of electrical goods made by small manufacturers in the early days of the industry. The Fair Trading Council for the electrical industry had placed the ironmonger at the bottom of the list. Unless they took active steps there would be no recognition of the valuable pioneering work that was done by the ironmonger.

"Lewcos" Wire Tables

We have received from the London Electric Wire Co. & Smiths, Ltd., a copy of the new "Lewcos" Wire Tables, which have recently been revised. These include tables of British standard sizes of annealed copper wires, standards for solid and stranded circular conductors, nickel-chrome resistance wire, wire gauges in common use, and other wire tables which should prove of considerable value to electrical engineers. Copies of the new edition can be obtained on application to the company at Church Road, Leyton, E.10.

The Smithfield Show

At the Smithfield Show which will be held at the Royal Agricultural Hall from December 4th-8th, Messrs. Petters, Ltd., will again be showing a representative group of their products, including atomic Diesel engines, generating sets, air-cooled petrol engines, oil engines, and semi-Diesel engines.

Trade and Engineering

We have perused with interest the first issue of *Trade and Engineering*, a new sixpenny monthly review which is a development of the weekly *Times Trade and Engineering Supplement*. The 128 pages contain a comprehensive and authoritative survey of industrial progress, prominence being given to the results of research and to financial and commercial conditions abroad. A special section is this month devoted to "Industrial Scotland," and next month the North-East Coast is to be similarly dealt with.

The Batti-Wallahs' Society

The next Batti-Wallahs' luncheon takes place at the Hotel Metropole, London, W.C.2, on December 13th, when Mr. T. O. M. Sopwith will deliver an address on "The America's Cup."

Dutch Radio Exports

The value of the exports of radio apparatus from Holland promises to reach a record total this year. According to the statistics of the Central Bureau, the volume rose from 992 gross tons in September to 1,170 tons in October, as compared with 843 tons in October, 1933. The value of the exports has been growing in recent months and reached 6,103,000 fl. in October as against 5,413,000 fl. in the previous month. The total for the first ten months of the year is 34,218,000 fl., as compared with 39,599,000 fl. in the whole of 1933 and 38,437,000 fl. in 1932.

Trade Announcements

The telephone number of the Electric Wiring Co., 72, Osnaburgh Street, Euston Road, N.W., has been changed to

"Novelties" at the Building Centre

ALWAYS an interesting showroom, the Building Centre, 158, New Bond Street, London, W.1, has now an additional attraction. Yesterday (Thursday) a Novelty Exhibition was opened there and will continue for a month, the display comprising new types of material and modern equipment. Electrical apparatus is given prominence, nearly half of the exhibits coming within this category.

Improved types of heating equipment are shown by the following:—Electric fires: Belling & Co., Berry's Electric, Ltd., Ferranti, Ltd., the General Electric Co., Ltd., Harland & Wolff, Ltd., and the Jackson Electric Stove Co., Ltd. Convectors: the Artic Fuse & Electrical Manufacturing Co., Ltd., British Trane Co., Ltd., Greene, Phillips & Co., and Unity Heating, Ltd. Ceiling heaters: Johnson & Phillips, Ltd., and Unity Heating, Ltd.

Electric cookers are exhibited by the Jackson Electric Stove Co., Ltd., and Moffats, Ltd., and a self-contained boiling plate is shown by the Hotpoint Electric Appliance Co., Ltd.

Other exhibits include a light reflector, bedlight fitting, air circuit breaker and an illumination meter (General Electric Co., Ltd.); samples of flexible cords for domestic apparatus (Cable Makers' Association); a programme clock and an Electroprint time stamp (International Time Recording Co., Ltd.); adaptable electric plugs and switches (A. P. Lundberg & Sons, Ltd.); a fuse-plug outlet (M. K. Electric, Ltd.); four-way d.p. 15 A "Slyp-on" teak-cased fuse boards, a 15-A d.p.i.c. switch and fuse combination, "Tuckamel" finished, and silent switches (J. H. Tucker & Co., Ltd.); a time switch with hand-wound drive (Venner Time Switches, Ltd.); a 10-A fused switch plug top (Wandsworth Electrical Manufacturing Co., Ltd.); lighting fittings (Bakelite, Ltd.); unit light fittings (Troughton & Young, Ltd.); a hand lamp and a dental standard (the "Typerlite" Co.); automatic flap-action bed light (Twentieth Century Electrical); bath spray fitting and cylinder belt heater (Santon, Ltd.); extractor fan for fitting to existing windows (Crittall Ventilator Co.); water jug (Falk, Stadelmann & Co., Ltd.); built-in refrigerator (Electrolux, Ltd.); table air purifying units (Ozonair, Ltd.); name plates in "Traffolyte" plastic material (Metropolitan-Vickers Electrical Co., Ltd.); lift equipment and model of lift cage (Marryat & Scott, Ltd.); and accessible flush wall clocks (Smith's English Clocks, Ltd.).

Visitors to the exhibition should take the opportunity of inspecting the permanent display of the British Electrical Development Association at the Centre. This has now been reconstructed, the former "cabin" exhibits having been displaced by an open and easily accessible show.

At the Centre there is also a working model of a type of garage, formerly exhibited at the Ministry of Transport, which has been designed to meet current conditions. The principle involves the use of a series of numbered cradles which are hung vertically on an electrically driven endless chain, each cradle containing a car and responding to the pressure of a numbered button. Apart from economy in time and labour, there is the important feature that the ground space required is small; about 18 ft. by 24 ft. is sufficient area for two cars abreast, the height of 80 ft. allowing for the garaging of eighteen cars. The manufacturers in this country are Messrs. Henry Simon, Ltd., in conjunction with the Metropolitan-Vickers Electrical Co., Ltd.

Museum 3560. The company asks for catalogues and display material.

British National Electrics, Ltd., has opened a further branch covering the South and West Yorkshire district and the Counties of Nottinghamshire, Derbyshire and Lincolnshire. The branch will also represent the associate companies: Archibald Low Electrics, Ltd.; the J.P. Tubular Heater Co., Ltd.; and the "Universal" appliances of Messrs. Landers, Frary & Clark. The address is 6, York Place, Leeds, 1. (Tel.: 21774.) Mr. W. L. Hambly, of the company's London office staff, is the district manager.

Messrs. Beaumont & Blackburn, electrical engineers, of Dewsbury, have removed to 30, Church Street, Dewsbury.

The electrical engineering business of the late Mr. A. Brook, at Church Lane and South Baileygate, Pontefract, has been taken over by Messrs. Arthur Brook (Pontefract), Ltd.

Superlamp, Ltd., has opened a branch at 21, Queen's Road, Southend-on-Sea.

For Sale

The Northampton Electric Light & Power Co., Ltd., has for sale transformers, neutral compensator and choke coil.

Messrs. Edwards, Son & Bigwood will sell by auction on November 20th at 61, Chester Street, Aston Road, Birmingham, surplus plant and machinery.

(See our classified advertisements.)

Prices of Materials

Messrs. F. Smith & Co. report, November 14th: No change in the price of electrolytic copper, wire rods, bars and h.c. wire and silicium bronze wire.

Messrs. Edward Till & Co. report, November 14th: No change in the price of India-rubber, Para fine.

Messrs. James & Shakespeare report, November 14th: No change in the price of copper bars (best selected), sheet and rod and English pig lead. Electrolytic copper sheets, £30 to £31, 10s. decrease.

New Catalogues and Lists

British Thomson-Houston Co., Ltd., Rugby.—Pamphlet No. AG.494, well illustrated, dealing with electrical equipment for metal-working and woodworking machine tools.

Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Barford Street, Birmingham, 5.—A pamphlet dealing with a new motor-starting switch.

Sloan Electrical Co., Ltd., 8/12, Golden Lane, E.C.1.—An 85-page catalogue of wiring accessories.

Wardle Engineering Co., Ltd., Old Trafford, Manchester, 16.—A catalogue of "Maxheat" tubular heaters.

David Brown & Sons (Hudd.), Ltd., Huddersfield.—A survey of the field of application of gears in the automobile industry.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A catalogue of electrical gifts for Christmas.

Milne & Longbottom, Elm Works, Mere Lane, Rochdale.—Leaflets on a new range of switchgear and a patent low-voltage lighting system.

British Electrical & Manufacturing Co., 23a, Rathbone Place, Oxford Street, W.1.—A catalogue of domestic electrical equipment.

Warm-Glow, Ltd., Leigh-on-Sea.—A pamphlet on the "Warm-glow" electric blanket.

Brown Brothers, Ltd., Great Eastern Street, E.C.2.—A leaflet on the "Gyrator" electric washer.

British Insulated Cables, Ltd., Prescot, Lancs.—A leaflet on static condensers for eliminating radio interference.

Runbaken Company, 280, Deansgate, Manchester.—Particulars of the "Dynometer."

Donovan Electrical Co., Ltd., 46, Great Charles Street, Birmingham, 3.—A 110-page catalogue of electrical apparatus.

Sankey Oil Systems, Ltd., 234A, High Street, Brentford.—A leaflet on a new automatic coal stoker.

British Aluminium Co., Ltd., Adelaide House, E.C.4.—A book on aluminium coachwork for passenger vehicles.

"Diamond H" Switches, Ltd., Gunnersbury Avenue, W.4.—A brochure dealing with a new oven thermostat.

Bruce Peebles & Co., Ltd., Edinburgh.—Nine three-colour leaflets illustrating the constructional features of a new range of industrial a.c. motors.

J. Millet, 39, Farringdon Road, E.C.1.—A price list of electrical and wireless accessories.

Dorman Long & Co., Ltd., Middlesbrough.—A booklet entitled "An Analysis of Coal and Coke."

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—A leaflet on self-acting stator and rotor starters.

British Rectifiers Engineering Co., 112, St. Aldates, Oxford.—A new season's list of "Carfax" battery charging plant.

General Resistors, Ltd., Old Radford Works, Ilkeston Road, Nottingham.—A catalogue of spirals and elements.

Lincoln Electric Co., Cleveland, Ohio.—Particulars of the "Lincoln" welder.

Davidson & Co., Ltd., Sirocco Works, Belfast.—A publication on "Sirocco" portable pneumatic conveyance units.

Direct Electric Lamp Co., Ltd., 72, Shoe Lane, E.C.4.—A catalogue of 1935 radio receivers.

L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, Kingsway, W.C.2.—Catalogues of suitable electrical gifts for Christmas.

Bankruptcy Proceedings

W. E. Magson, 54, Vyner Street, York, lately 10, Castlegate, Malton, electrical engineer.—The first meeting of creditors was held at the Official Receiver's offices, Bank Chambers, Scarborough, on November 6th. According to the statement of affairs returned by debtor there were ranking liabilities of £305 and net assets of £25, leaving a deficiency of £281. Debtor attributed his failure to bad trade consequent on a typhoid epidemic in Malton and competition from outside. The case being a summary one was left in the hands of the Official Receiver, as trustee.

D. A. McDonald Trew, 36, Binley Avenue, Binley, Coventry, lately trading as "Trew Electrical Service," 59, Primrose Hill Street, Coventry.—The public examination of this debtor was held at the County Hall, Coventry, on November 5th. Debtor had returned liabilities of £211 and a deficiency of £191. He attributed his failure to inexperience, bad trade, and lack of capital.

W. C. Loft, electrical dealer, Unity House, Dartford Road, Dartford.—Receiving order made November 5th on a creditor's petition.

F. E. Saunders, electrical and mechanical engineer, 10A, Page Street, Westminster, S.W.—Trustee, Mr. M. G. Hacker, 329, High Holborn, W.C., released October 26th.

H. G. Lawson (E. Cooper), radio and electrical dealer, 1002, Stratford Road, Hall Green, Birmingham.—Trustee, Mr. C. Hoult, 159, Great Charles Street, Birmingham, Official Receiver, released November 3rd.

R. S. Wright, wireless dealer, 33, Broomfield Road, Coventry.—Trustee, Mr. C. J. Band, 9-11, High Street, Coventry, Official Receiver, released November 7th.

J. E. Ridgway, electrical and radio engineer, Hightown, Congleton, and at Biddulph.—Trustee, Mr. P. M. Milward, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver, released November 6th.

L. Wardleworth (L. & V. Wardleworth), radio and electrical engineer and contractor, 335, Bury Old Road, Prestwich.—Trustee, Mr. L. A. West, Byrom Street, Manchester, Senior Official Receiver, released October 31st.

C. J. Mount, electrical contractor, White House, East Acton Lane, W.—First and final dividend of 3s. 7¼d. in the £, payable November 16th at 29, Russell Square, W.C.

G. Y. Entwistle, electrician, 68, Queen Street, Darwen.—Receiving order made November 2nd on debtor's own petition. Public examination December 5th at the County Court House, Blackburn.

G. E. Palmer, wireless and electrical dealer, 1, Two Mile Hill, St. George, Bristol.—Trustee, Mr. J. D. Turner, 26, Baldwin Street, Bristol, released October 30th.

S. L. Gillitt (G.E.T. Electrical Supplies Co.), electrical goods dealer, Offerton Lane, Offerton, nr. Stockport.—Last day for receiving proofs for dividend November 21st. Trustee, Mr. R. K. Clark, Byrom Street, Manchester, Official Receiver.

A. Fielding, electrician, 223, Whalley New Road, Blackburn.—First and final dividend of 4s. 1d. in the £, payable November 9th at District Bank Chambers, Blackburn.

Company Liquidations

Magnacore, Ltd., Salisbury House, London Wall, E.C.—The first meetings of the creditors and shareholders under the compulsory liquidation of this company were held on November 9th at Carey Street, W.C., before Mr. H. P. Naunton, Assistant Official Receiver. The company was formed in September, 1932, to carry on business as manufacturers and producers of transformers and other wireless and electrical apparatus. Mr. H. N. Moss, who was appointed managing director for fourteen years at a salary of £650 per annum, commenced business at James Street, Camden Town, in May, 1932, and traded as Magnacore Transformer Company. During the early stages of the business Moss obtained a provisional patent relating to transformers and similar wireless components, and applied for registration of various trade marks. The company agreed to acquire the provisional patent and trade marks in consideration of their refunding Moss the cost of obtaining the letters and certificates of registration, not exceeding £50. In April, 1933, the company negotiated with the liquidator of B. & J. Wireless, Ltd., for the lease of premises at Alsen Road, Holloway, and the business at the price of £200. In the following month the company extended the scope of the business and formed Neon Portable Units, Ltd., which traded at a loss. The 1933 accounts showed that on a turnover of £10,537 there was a gross profit of £379 but a net loss of £2,748. A debenture of £3,000 was issued to secure the company's bank overdraft and on February 7th, 1934, Mr. F. S. Sharles was appointed as receiver for the debenture holders. A statement of affairs was presented showing unsecured liabilities of £5,904 and debentures claims of £2,993 against assets valued at £2,350. The liquidation was left in the hands of the Official Receiver, who remarked that there appeared to be no possibility of any surplus becoming available for distribution among the unsecured creditors.

General Cable Manufacturing Co., Ltd.—Winding up voluntarily for the purpose of the sale of the undertaking to a new company which has been formed (ELECTRICAL REVIEW, November 9th, page 662). Liquidator, Mr. A. J. Foster, 37, Walbrook, E.C.

Ellancee Radio, Ltd.—Meetings December 6th at 72a, St. Peter's Street, Derby, to receive an account of the winding-up by the liquidator, Mr. W. H. Warren.

Morgan Crucible Co., Ltd. (incorporated in 1930).—Meeting of the deferred ordinary shareholders on December 19th, at Battersea Works, Church Road, Battersea, to receive an account of the winding-up by the liquidator, Mr. H. C. V. Adams.

Private Arrangements

L. W. Cole, 17, High Street, Epsom, electrical contractor.—The creditors interested herein were called together on November 7th, at the offices of Mr. P. S. Booth, Kimberley House, Holborn Viaduct, London, E.C., when it was reported that the liabilities amounted to £627, of which £389 was due to the trade, and the balance to the bank, who were unsecured. The net assets were £120, leaving a deficiency of £506. A deed of assignment had been executed to Mr. Booth as trustee, and it was decided that the deed should be confirmed, and that a guaranteed offer of 5s. in the £ should be accepted if it was forthcoming within seven days.

Winding-up Petitions

Telsen Electric Co., Ltd.—A petition for the winding-up of this company has been presented to the High Court by the British N. S. F. Co., Ltd., and will be heard in London on November 19th.

Brice (Electrical), Ltd.—A petition for the winding-up of this company has been presented to the County Court, Hastings, by Lloyds Bank, Ltd., and will be heard at Hastings on December 4th.

Electricity Supply

Lighting, Domestic, Power

Australia.—ELECTRICITY SUPPLY IN W.A.—The report of the Commissioner of Railways of the Western Australian Government for the year ended June 30th, 1934, shows that the capital expenditure on the electricity supply undertaking at that date was £1,271,000. Gross revenue during the period was £297,000, and working expenses £194,000. The energy sold amounted to 80 million kWh (an increase of 6.7 per cent. over the previous year), and the maximum demand was 21,000 kW. The coal consumption per kWh generated at the 32,000-kW station was 2.93 lb., and the working expenses 0.58d., a decrease of 0.03d. on the previous year. Extensions are planned comprising a 25,000-kW turbo-alternator, condensing plant, boiler-house equipment, and h.v. and l.v. switchgear. The staff numbers 199, of which twenty-six are on the salaried list.

VICTORIA ELECTRICITY COMMISSION.—The fifteenth annual report of the Victoria Electricity Commission for 1933-34 shows a profit on the supply of electricity of £393,093. Various deductions reduced the net profit to £33,109, compared with £3,429 last year. Revenue from the sale of electricity was £2,265,233, an increase of £112,448, while the number of customers being served at the close of the year (192,271) exceeded the figure of a year before by 6,780. Sales amounted to 474,452,023 kWh (439,030,189 kWh in 1932-33). Production at the Yallourn power station created a new record, both for load carried and the kWh generated. The maximum load during the year was 86,000 kW, and energy generated was 381,443,400 kWh. Expenditure during the year on the principal extension project approved by Parliament in 1928 was £22,516 on the Yallourn section of the work, bringing the total for all sections at June 30th, 1934, to £1,712,793. The Commission's loan indebtedness at the end of the financial year amounted to £19,109,658. In May the Commission raised in London a loan of £600,000, partly to meet the purchase price of the Ballarat and Bendigo undertakings of the Electric Supply Company of Victoria (£296,472), the balance being applied to the redemption of 6 per cent. Melbourne Electric Supply debentures held in London (£256,113).

Barnoldswick.—ADMINISTRATION.—A sub-committee has been appointed to inquire into the organisation of the Urban District Council's Electricity Department with a view to possible improvements.

Bridgend.—SERVICE CHARGES.—The Urban District Council is considering the abolition of electrical service charges.

Bristol.—SUB-STATION.—The Electricity Committee has purchased a site at St. John's Lane for the erection of a master sub-station.

Bulgaria.—NEW POWER STATION.—A new hydro-electric power station has recently been completed at Kritchim, in Southern Bulgaria. The plant, which utilises the power of a fall on the River Vatcha under a head of about 265 ft., has a capacity of 7,000 kW.

Coventry.—STREET LIGHTING.—The Electricity Committee has decided to light by electricity 2¾ miles of the Kenilworth

This picture of a Chinese theatre and shop at the New World, Singapore, with spectacular lighting effects, comes from a Singapore reader

Road at a cost of £1,328. The poles will be high enough to enable conversion to electric-discharge lighting to be made at a later date.

MAINS.—The city electrical engineer has been authorised to lay a new h.v. feeder-main (£550) to augment the supplies to the Canterbury Street works of Messrs. Singer & Co., Ltd.

Darlington.—MAINS EXTENSIONS.—The Town Council is to extend electricity mains in Hunstanburgh Road, King Street, and Ravensdale Road.

Eastbourne.—LOAN.—The Electricity Committee is seeking sanction to borrow £7,650 for electricity extensions to the Beachlands Estate, Pevensey Bay.

France.—DISTRIBUTION.—The Société des Forces Motrices de la Vienne is making good progress with the construction at Saumur of a 100,000/90,000-V inter-connecting station to link up its distribution system with that of the Société Transport d'Energie Centre-Ouest by means of which it will be possible to supply large quantities of power to distribution undertakings in N.W. France.

Gelligaer.—FURTHER POWERS SOUGHT.—The Urban District Council is to promote a Bill in the next session of Parliament providing, among other things, for further powers in connection with the electricity undertakings.

Gravesend.—YEAR'S PROGRESS.—We are informed by Mr. C. F. McInnes, borough electrical engineer, that the figures given in the table on page 657 of last week's issue are for the Gravesend account only. The undertaking also operates the Northfleet Order, and the financial results (including Northfleet) are as follows (1933 figures given in parentheses): Total revenue, £105,477 (£94,222); total cost, £51,007 (£46,204); net profit, £18,405 (£11,478); electricity sold, 28,079,275 kWh (24,955,094 kWh).

ELECTRICAL PROPAGANDA AT THE CINEMA.—The Electricity Committee has under consideration a proposal that arrangements should be made to show at one of the local cinemas the programme of talking films produced by the British Electrical Development Association advertising the uses and advantages of electricity.

Hazel Grove and Bramhall.—LOAN.—The Urban District Council has received sanction to a loan of £1,000 for the purchase of premises in London Road, Hazel Grove, for conversion into electricity showrooms.

India.—NEW MADRAS HYDRO-ELECTRIC SCHEME.—In the Madras Legislative Council it was stated that the Government has under immediate consideration the Kolar hydro-electric scheme, and that it has also investigated the possibility of developing power at Chettipet weir in the Godavari delta.

Ipswich.—LOAN.—The Electricity Committee is seeking sanction to borrow £50,000 for mains and services.

Kettering.—STREET LIGHTING.—Revo "Grays" standards have been installed at Station Road, Kettering. They are mounted on one side of the road, the lamps being suspended over the centre of the road from extension brackets. Revo type C.7228 refractor fittings are used.

Leicester.—LOAN.—A £50,000 loan has been approved for a sub-station, and a transformer station is proposed for Doncaster Road, Leicester.

Lincoln.—PROGRESS.—A report just issued by the city electrical engineer (Mr. F. Newey) states that during the six months to the end of September last 1,100 new consumers were connected, while there were 512 new cookers and ninety-five water heaters installed. Mains were laid in eighty-seven streets, the additional load connected amounting to 5,024 kW, including 1,000 kW to Ruston and Hornsby. Prepayment wiring installations numbered 615, bringing the total up to 2,611. There was an increase of 1,925,387 kWh (or 22 per cent.) in the electrical energy supplied by the Central Electricity Board (10,680,276 kWh). In October the quantity of electricity sold (2,338,039 kWh) was a record for the undertaking and 552,429 kWh above the figure for the corresponding month last year.

MAINS EXTENSIONS.—The City Council is to carry out mains extensions in Yarborough Crescent, Cannon Street, Carhulme Road, and Mill Road (£1,750).

London.—The St. James' & Pall Mall Electric Light Co., Ltd., informs us that the kW connected to the mains reached 50,000 during October, with a maximum demand of 20,082 kW. The area supplied is 0.256 sq. miles, giving a maximum demand of 78,445 kW per sq. mile.

Lowestoft.—LOANS.—The Town Council is to apply for loans of £10,000 for meters, £8,000 for services, and £5,000 for mains.

Maidenhead.—MAINS EXTENSION.—The Town Council is to extend the 6,600-V main from Down Place along Windsor Road to Oakley Green (£864).

Maidstone.—MAINS EXTENSIONS.—The Town Council is to extend its mains to Thurnham (£2,100).

Malvern.—OVERHEAD LINES.—The Urban District Council has consented to the Shropshire, Worcestershire & Staffs Electric Power Co. laying overhead and underground mains at Sherrards Green.

LOAN.—Sanction to a loan of £5,000 for mains and services has been received.

Manchester.—MONTHLY PROGRESS.—During September 1,759 applications for a supply were received from new consumers and 843 for additional supplies from existing consumers, representing a total of 5,132 kW. Orders for cookers amounted to 250, bringing the total on circuit to 13,636, while sixteen orders for wash-boilers and fifty-eight for water heaters were obtained, bringing the totals to 714 and 668 respectively.

Milton Regis.—MAINS EXTENSIONS.—The Kent Electric Power Co., Ltd., has informed the Rural District Council of its intention to lay l.v. cables in the parishes of Bapchild, Borden, Bobbing, and Upchurch.

Nantwich.—NEW MAIN.—The Council has consented to the Electricity Distribution Co., Ltd., laying a main from Wrenbury to Audlem to link up with the Audlem supply, thus completing a circuit.

Newport (Mon).—LOANS.—The Electricity Committee has decided to make an application to the Electricity Commissioners for loans of £20,000 for domestic purposes, £8,000 for services, £3,000 for meters, and £2,000 for assisted wiring.

Nigeria.—ELECTRICAL ENGINEER'S REPORT.—In the annual report of the Electrical Branch of the Public Works Department of Nigeria Colony, Mr. C. H. Pickworth, the electrical engineer-in-chief, states that the capital expenditure at March 31st for the three undertakings of Lagos, Port Harcourt and Kaduna was £317,000 after writing down £129,000 in respect of Lagos. The gross revenue was about £81,000 and expenditure £83,000. There has been considerable improvement over the previous year, as sales increased from 5.25 million to 6.27 million kWh; an increase of 30 per cent. at Lagos accompanied a reduction there in the average price from 3.41d. to 3.01d. per kWh. The consumption for domestic and residential uses increased from 1.03 million to 1.29 million kWh, but more rapid progress is anticipated in future due to the introduction of a scheme for hiring cookers, water heaters and refrigerators, and for assisted wiring. The maximum loads on the power stations were: 1,500 kW at Lagos, 108 kW at Port Harcourt, and 126 kW at Kaduna. From April 1st, 1933, the Engudu undertaking (formerly controlled by the Railway Department) has been operated and managed by the Electrical Branch.

Northern Ireland.—BELFAST.—The Electricity Committee has under consideration a scheme, estimated to cost about £30,000, for various extensions, including the following: Harbour power station: control room and switch house extension, £10,000; provision of system operation control diagram, £800; new boiler feed pump, £1,200; new boiler feed system for higher temperature feed, £2,800; water cleaning screen, £3,500; 100-ton crane, £3,700; extension of l.v. a.c. station auxiliary supply, £4,250; renewal of steam piping, £1,200. East Bridge Street station: extension of automatic telephone system, £500.

Ogbourne St. Andrew.—SUPPLY NEGOTIATIONS.—The Parish Council is negotiating with the Marlborough Town Council for a supply of electricity.

Peterborough.—PUMPING PLANT.—The Water Committee is to install an electrically driven duplicate pumping plant (84,000 gal. per hour capacity) at Etton.

Portsmouth.—SPECIAL ORDER.—The Electricity Committee recommends that application be made to the Electricity Commissioners for a Special Order to enable the Corporation to provide a supply to that part of Gosport which is not already served by the Portsmouth electricity undertaking. The proposed scheme is an extensive one, and includes proposals to acquire the Gosport & Alverstoke Electric Lighting Co. and to erect showrooms at Gosport.

Ramsbottom.—REDUCED CHARGES.—The Lancashire Electric Light & Power Co., Ltd., has informed the Urban District Council that it is making a reduction of 1d. per kWh in the flat rate lighting charge, as from the first meter readings in 1935.

Redditch.—REDUCED CHARGES.—The Shropshire, Worcestershire & Staffordshire Electric Power Co. has intimated to the Urban District Council that the company has now considered the question of a reduction of charges for electricity within the urban district at the suggestion of the Council. It is stated that certain reductions are being made to apply as from the meter readings this quarter. It is also stated that with regard to private houses a special low rate for larger consumptions has recently been introduced, and that a reduction will be made in the secondary charge in the business lighting rate from 2d. to 1½d. per kWh. In addition, the lighting flat rate will be reduced to 5½d. per kWh. A rebate of 1d. per kWh to users of prepayment meters will be made general.

Rotherham.—METER RENTS.—The Electricity Committee recommends that the following scale of meter rents shall be put into operation:—Up to 2 kW, 1s. 6d. per quarter; up to 3 kW, 2s. per quarter; and up to 5 kW, 3s. per quarter. The charges for larger sizes are to remain as at present.

Rothwell.—EXTENSION.—Electrical Distribution of Yorkshire, Ltd., proposes to lay cables to Rothwell Haigh estate (£4,000).

Rugby.—REDUCED HIRING CHARGES.—The Town Council has adopted the following reduced charges for hired electrical appliances: Cookers: breakfast, 2s. 6d. per quarter; for four persons, 3s.; for six persons, 4s. Water heaters, storage tanks: 1½-gal., 2s.: 3-gal., 2s. 6d.; 5-gal., 3s. 3d.; 12-gal., 5s. Circulators: hand controlled, 2s. 6d.; thermostatic, 3s. Wash-boilers, 3s.

Runham (Norfolk).—SUPPLY AVAILABLE.—Electricity is now available in the village, the first installation being switched on at the Methodist Church on November 6th.

South Africa.—LICHTENBURG SCHEME.—The Town Council of Lichtenburg, Transvaal Province, is urging the Provincial Administrator to approve the raising of a loan of £16,000 for a new power station. The present plant is so inadequate for the town's needs that the mayor describes it as a hindrance rather than an asset to the town.

PRETORIA.—The 1933-34 report of the city electrical undertaking (electrical engineer, Mr. L. L. Horrell) shows an increase in electricity sales from 38,863,210 kWh to 44,613,313 kWh (14.8 per cent.). Towards the end of 1932 the power station extensions initiated during 1930 were completed, thus increasing the generating plant by 12,500 kW, and at June 30th this year the capacity of installed plant totalled 29,000 kW. Domestic sales amounted to 26.8 per cent. of the total and showed an increase of 7.8 per cent. over the figures for the previous year. Mr. Horrell suggests that a reduction in tariffs, and facilities for the purchase and installation of appliances would be followed by a greatly increased consumption and revenue from this source. The cost per kWh sold was 1.024d. (1.128d. in 1932-1933). Financial statistics show a revenue from the sale of electricity of £232,659 (£211,344 in 1932-1933),

An example of electric-discharge lighting at Wadham Road, Walthamstow. "Highway" fittings made by the Engineering & Lighting Equipment Co., Ltd. house 400-W lamps; these fittings give complete adjustability of the light distribution for all spacings and heights. In this case the lamps are 300 ft. apart and 23 ft. 6 in. high

an expenditure of £190,518 (£182,747), leaving a profit of £42,141 (£28,597). With regard to installations, the following figures are of interest, the 1932-33 figures being shown in parentheses: Electric cookers, 323 (198); water heaters, 7 (5); motors, 33 (25); refrigerators, 168 (105); new consumers, 347 (199). During the last six years the staff employed has increased by 41 per cent.

Stanion (Northants).—NEW SUPPLY.—Kettering Electricity Department is to introduce an electricity supply to Stanion, permission having been obtained to erect overhead lines from Oakley to Stanion and distribution lines in the village.

Stone (Staffs).—LOANS.—The Urban District Council is to apply for sanction to loans of £2,500 for the proposed extension of the electricity supply to Aston and Little Stoke, £10,000 for unspecified mains and services, £1,000 for meters, and £500 for plant.

Switzerland.—POWER PROJECT.—According to *The Times*, the construction of the Dixence hydro-electric power plant in Canton Valais is nearing completion. It is one of the largest hydro-electric plants in the world, and its ten powerful turbines will work under a waterfall of about 5,741 ft. The plant is nearly two miles south of Sion, in the Rhône valley, at the foot of the wooded hills on which are situated the "Mayens de Sion." It consists of five groups each of one three-phase alternator driven by two Pelton turbines. Each group is capable of producing nominally 21,250 h.p. The power will be distributed all over French-speaking Switzerland, an area of about 4,350 square miles, and part of it will be exported to France.

Walsall.—SUPPLY EXTENSION.—The Electricity Committee is to provide a supply to the South Staffs Water Works. Co. at its works at Bourne Vale pumping station, Chester Road, Aldridge, at an estimated cost of £3,150.

Watford.—FRINGE ORDER.—The Electricity Committee recommends that permission be given to the Chesham Electric Power Supply Co. to apply for a Fringe Order to supply premises at Water End at present within the Corporation's area of supply.

Winchester.—OVERHEAD LINES.—The City Council has received sanction from the Minister of Transport to place overhead lines in the city and rural districts.

Worcester.—MAINS.—The Electricity Committee recommends the spending of over £11,000 on electric supply main extensions in the Barbourne, Northwick, and Rainbow Hill districts, in order to meet the increased demand and form a ring main system.

Worthing.—LOANS.—The Electricity Committee is seeking sanction to borrow £2,500 for wiring installations, £5,000 for mains renewals, £25,000 for apparatus, and £25,000 for mains and services.

York.—SUB-STATION.—The Electricity Committee recommends the purchase of a site at Copmanthorpe for the erection of a sub-station.

Traction

Australia.—W.A. GOVERNMENT TRAMWAYS.—On the Western Australian Government tramways system 17¼ miles of double track and 23½ miles of single track were operated during the year ended June 30th last, a slight increase on the previous year. Earnings were £280,000 and working expenses £232,000. After allowing for interest, there was a loss of £4,100, compared with a profit of £3,200 for 1932-1933, the return on capital (£1,121,000) being 4.28 per cent., as against 4.98 per cent. Earnings per car-mile (3,384,000 car-miles) amounted to 19.87d. and working expenses to 16.47d., including 3.04d. for electricity, an increase of 0.09d., the total consumption being 10.3 million kWh. The number of passengers carried was 29.5 million (8.73 per car-mile). A trolley-bus service was opened in October, 1933. In the subsequent nine months three buses ran 71,000 miles and carried 546,000 passengers for an energy consumption of 2.22 kWh per bus-mile.

SYDNEY.—An A.E.C. " Q " type double-deck trolley-bus has been placed in service on the Sydney tramway system. This vehicle is the first of its type to be used in Australia. It is working with two trolley-buses already in service.

Birmingham.—TROLLEY-VEHICLES.—In its next Parliamentary Bill the Corporation proposes to seek power to provide trolley-vehicles along Coventry Road.

France.—STATE RAILWAY ORDERS.—For service on the Paris-Le Mans main line of the French State Railways, electrification of which has now been begun, twenty-eight electric locomotives of 4,000 h.p. for the haulage of express trains and forty-two double-bogie locomotives of about 1,600 h.p. for goods and slow trains have been ordered. Altogether 184 million fr. will be expended on rolling stock for this line and certain suburban extensions.

Germany.—NO MORE TRAFFIC LIGHTS.—The Reich Minister of the Interior has vetoed the use of more traffic lights in Germany. He declares, according to the Berlin correspondent of the *Daily Telegraph*, that experience has shown that the increase in the number of mechanical signals which has been noticeable during the past few years serves no useful purpose. Berlin was the first European metropolis to introduce the traffic lights after their inception in the United States. The system then introduced has, however, not been changed since, and has, consequently, become too rigid for modern requirements, being based on time-control alone.

Southern Railway.—ELECTRIFICATION.—The first trains on the new electrified section of the Southern Railway to Sevenoaks were run on Sunday. This scheme adds 23 miles to the Southern electric routes and it has cost £500,000.

Sweden.—RAILWAY ELECTRIFICATION.—*Reuter's Trade Service* learns from Stockholm that electrification work on the main line between Gothenburg and Malmö has now proceeded so far that electric trains will run from December 1st on the section between Malmö and Angelholm, a distance of 83 km. (the whole length of the main line is 299 km.).

Switzerland.—IMPORTANT LINE ELECTRIFIED.—The line of the Swiss Federal Railways from St. Margrethen to Buchs, along the eastern frontier, has just been opened to electric traction. The line is 24 miles long, and now gives electric-train connections to the north-east corner of Switzerland from the Austro-Swiss expresses on the Arlberg route. It is estimated that an annual saving of 267,000 Sw. fr. will be effected, compared with steam traction. The 1935 budget of the Swiss Federal Railways contains an allowance of 2,022,000 Sw. fr. for further electrification schemes.

Traffic Signals.—Traffic signals are to be erected at Bryn Cross, Ashton-in-Makerfield; Clay Cross; Pump Corner, Dorking; Market Square, Crewkerne (under consideration); and at West Hartlepool.

Turkey.—ELECTRIC RAILWAY.—A project is reported to be under consideration for the construction of a single-track electric railway about 44 miles in length between Filyos and Eregli, on the Black Sea, to provide a more rapid and cheaper transport service for coal from the fourteen collieries in the Eregli (Heraclea) district of Turkey.

United States.—DIESEL-ELECTRIC LOCOMOTIVES.—An *Exchange* message from Philadelphia states that the Pennsylvania Railroad has placed an order for fifty-seven streamlined electric locomotives at a cost of $15,000,000 (£3,000,000). The new locomotives will be capable of a speed of 90 miles an hour and will be used to inaugurate the high-speed service between New York, Philadelphia, Baltimore, and Washington, in February.

Wallsend.—NEW TRAMWAY ROUTE.—The Omnibus Committee recommends that proposals by the Tyneside Tramways & Tramroads Co. for the provision of an additional route from the junction of Prudhoe Street and Tynemouth Road to High Street West shall be approved.

Whitley Bay.—LIGHT RAILWAY.—A syndicate of local business men is contemplating the establishment of an electric light railway between Cullercoats and St. Mary's Island at an estimated cost of £20,000. The proposals are still in a preliminary form, but they will shortly come before the Urban District Council for approval. It is proposed to illuminate the entire route with coloured lights. If the scheme is sanctioned it will be run for twenty-five years by a private concern, after which the Urban District Council will have the option of buying it at cost price. The idea is to further enhance Whitley Bay's amenities as a pleasure resort.

Communications

Great Britain.—NEW LISTENERS.—During October 91,000 wireless licences were issued, making a net increase of 76,000. The total number of licences at the end of the month was 6,549,000, which is 781,000 more than at the end of October, 1933.

RADIO INTERFERENCE.—The London and Home Counties Joint Electricity Authority, replying to a complaint by the Post Office regarding alleged radio interference at Dorking by rectifying plant, has stated that other interference would be caused if it installed the plant recommended by the Post Office. The Authority added that it did not recognise any liability to provide a supply free from interference, and that it did not propose to install the plant.

RADIO RELAYS.—Relay House, Westwood-in-Thanet, which is said to be the first building designed specially for relaying, was opened last week. It provides a service to Ramsgate, Margate, and Broadstairs, and has at the moment 3,000 subscribers.

The Alnwick Urban District Council is considering an application from Messrs. Knox Bros. for permission to operate a broadcast relay system in the town.

The I.E.E. Committee on Radio Interference

AN official statement on the work of the Institution of Electrical Engineers' Committee on Radio Interference suggests that it has been instrumental in fostering a desire to rectify this serious annoyance and bringing together in mutual effort those who are able to take action towards its elimination.

The Committee finds that listeners and those who advise them have not yet done on their own receiving sets all that is possible to mitigate some of the effects of interference. A memorandum on features of design and installation that should receive attention has been prepared by the B.B.C. for the Committee, emphasising the precautions which should be specially attended to by suppliers of radio sets and those who " service " them. This memorandum is to be published in the December issue of the I.E.E. *Journal*.

To enable manufacturers to appraise interference and understand how to correct offending plant and apparatus by fitting choke coils and/or condensers, a specification, which should help to render new equipment interference-free, is to be issued early in the new year by the British Standards Institution as a British Standard Specification.

The June meeting in Paris of the Special Committee of the International Electrotechnical Commission on Radio Interference, which is concerned with international standardisation, provided an approximate idea of the level of interference which other countries are thinking of accepting as permissible in connection with their regulations. This level is more tolerant than any of the countries would like to be in a position to prescribe, and more so than the I.E.E. Committee has desired to adopt as an " objective." But the Committee has agreed that if hard-and-fast regulations are to be laid down at the present time the more tolerant figure is inevitable.

The Committee is reluctant to be dogmatic on the subject of compulsory *versus* voluntary suppression of radio interference. There is at present much goodwill and readiness to help to rectify trouble where it is serious; the Committee believes that a threat now to impose compulsory regulations might have the effect of retarding rather than encouraging these influences. But when co-operation and goodwill have done their best there may be a residuum of recalcitrant cases in which some form of compulsion will probably be desirable.

The manufacturers of household apparatus are unwilling at the moment to express themselves definitely on the question of compulsion. The extent of the increase in price of appliances appears to depend materially on the level of interference which is permissible. Manufacturers have been very ready to prepare technically the design of non-interfering apparatus, but on account of increased price there may be a reluctance to market such apparatus until the requirement is made to apply to all—including importers. This, however, is not at the moment a practical issue because the Committee considers that more experience and investigation are needed before there can be any feeling of certainty that the proposed standards and methods of appraisement of radio interference are practical and could be effectively included in any form of official regulations. Although certain Continental countries are already imposing regulations for a measure of compulsory suppression at the source, the Committee would prefer to see the technical standards and methods better established before saying whether Britain should follow their example.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Eeview" containing the advertisement is given in parentheses below

Contracts Open

Australia.—SYDNEY.—Municipal Council. January 7th. Automatic boiler control equipment for three boilers at the Bunnerong power station. (A.Y. 12737.)*

January 14th. Supervisory control equipment for the remote control of switchgear and transformers in a 33-kV sub-station. (A.Y. 12764.)*

BRISBANE.—January 25th. City Council. One 18,750-kW steam driven turbo-alternator, together with cooling equipment, piping, &c. (A.Y. 12741.)*

Bath.—November 26th. Corporation. Electric lighting fittings for new municipal technical college. (See this issue.)

Batley.—November 20th. 11,000-V metal-clad sub-station switchgear. Specifications, &c., from the borough electrical engineer, Electricity Works, George Street; tenders to T. E. Craik, town clerk, Town Hall.

Beckenham.—November 19th. U.D.C. Steel lamp columns. (November 9th.)

Blackpool.—November 20th. Corporation. Eight 300-kVA fifteen 150-kVA and three 400-kVA transformers. (November 2nd.)

Brighton.—November 27th. Electricity Department. Electric lamps for street lighting for the year ending December 31st, 1935. (See this issue.)

Bridgend.—November 20th. Electricity Department. 11,000-V and 6,600-V 3-core cables. (See this issue.)

Ealing.—November 20th. Electricity Department. 11,000-V and 660-V metal-clad switchgear, and 660-V distribution fuse boards. (November 2nd.)

Hastings.—November 29th. Electricity Department. Materials for the year commencing January 1st, 1935. (October 26th.)

London.—November 27th. Metropolitan Water Board. Overhaul and repair of lighting and power installation at the head offices of the Board. (November 9th.)

Manchester.—November 19th. Electricity Committee. Water-cooling towers for Stuart Street power station. (November 2nd.)

Morocco.—RABAT.—December 27th. Posts and Telegraphs Department. Telephone cable. (A.Y. 12756.)*

New Zealand.—CHRISTCHURCH.—Electricity Department. January 15th. Metal-clad switchgear. (A.Y. 12723.)*

WELLINGTON.—Posts and Telegraphs Department. January 9th. Telephone dials, impulse wheels, &c. (A.Y. 12752.)*

January 21st. 100 microtelephone set cases and 100 microphone transformers. (A.Y. 12754.)*

January 24th. Telephone headgear receivers. (A.Y. 12753.)*

January 29th. Telephone instrument and switchboard cords. (A.Y. 12750.)*

Public Works Department. February 19th. 50-kV outdoor switchgear, including steelwork, for Henderson sub-station. (A.Y. 12758.)*

March 5th. Seven 8,000 kVA transformers. (A.Y. 12757.)*

Norwich.—November 22nd. Health Committee. Automatic telephone installation or alternatively complete overhaul of existing apparatus at Isolation Hospital. Particulars from city engineer.

Oldham.—November 17th. Electricity Committee. L.p. cable. (November 2nd.)

Peebles.—November 20th. County Council. Various works, including electrical alterations and additions to Kingsland House. Schedules from Dick Peddie & Walker Todd, architects, 3, Albyn Place, Edinburgh (deposit £1); tenders to joint county clerks.

Portsmouth.—November 21st. Corporation. P.i. and rubber-insulated cable for six months ending June 30th, 1935. (November 9th.)

Rochdale.—November 21st. Electricity Department. Ten 300-A switch cubicles for Dane Street power station. (November 9th.)

Scarborough.—November 23rd. Electricity Department. Electric cookers. (See this issue.)

Scunthorpe and Frodingham.—December 3rd. Electricity Department. One 500-kVA and one 200-kVA transformers (See this issue.)

South Africa.—JOHANNESBURG.—January 7th. Railways and Harbours Administration. One electrically driven overhead travelling crane. (A.Y. 12760.)*

Southend-on-Sea.—December 6th. Electricity Department. Two alternators and switchgear. (November 2nd.)

December 7th. Electricity Department. Adaptation of motors and apparatus on consumers' premises from d.c. to a.c. (See this issue.)

Walton and Weybridge.—November 28th. Electricity Department. One 11,000-V feeder cable. (See this issue.)

West Ham.—November 26th. Electricity Department. Coal and p.i. cables for twelve months ending December 31st. (November 9th.)

Weymouth and Melcombe Regis.—November 22nd. Corporation. Cable and feeder pillars. (November 9th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Burton-on-Trent.—Electricity Committee. Accepted. Switchgear and transformers (£2,890).—Metropolitan-Vickers Electrical Co., Ltd.

Chesterfield.—Electricity Committee. Accepted. Fitting reverse power relays and transformers at Walton sub-station (£576).—English Electric Co., Ltd.

Coventry.—Electricity Committee. Accepted. Cables (£4,405). —Union Cable Co., Ltd.

Hull.—Telephones Committee. Accepted. Insulators (£114). —W. F. Dennis & Co. Bronze wire (£252).—F. Smith & Co. Inside wire (£78).—W. T. Henley's Telegraph Works Co., Ltd.

Leeds.—Electricity Committee. Recommended. Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£573); Macintosh Cable Co., Ltd. (£1,026); Edison Swan Cables, Ltd. (£885); Telegraph Construction & Maintenance Co., Ltd. (£801). Boiler house plant and equipment at Kirkstall power station (£86,054). —International Combustion, Ltd.

London.—L.C.C.—CORRECTION.—We regret that in our last issue under this heading we incorrectly stated that the Hospitals and Medical Services Committee had accepted the tender of Messrs. J. & E. Hall, Ltd., for electric lifts at Fulham, New End (Hampstead), Paddington and St. Mary Abbots (Kensington) hospitals. This contract has been placed with Messrs. Evans Lifts, Ltd. (£3,130), who have also received the order for the installation of electric lifts at St. Giles' Hospital, Camberwell, and the Holborn and Finsbury Institution, at £1,603.

BRIXTON.—L.C.C. Education Committtee. Accepted. Electrical work at School of Building (£2,922).—Buchanan & Curwen, Ltd. This was the lowest of thirteen tenders, the highest being £3,837.

Malvern.—Urban Council. Accepted. Electrical equipment at the Isolation Hospital laundry.—Abell & Smith's Electrical Co.

Renfrewshire.—County Council. Accepted. Electrical work at Renfrew Road and Marchfield schools.—J. Kilpatrick & Son, Ltd.

Rotherham.—Rural District Council. Accepted. Electric lighting at houses at Swallownest, Aughton, Thurcroft, Wickersley, Bramley, Brinsworth, Whiston, Catcliffe, Dalton and Brampton Bierlow.—H. Sullivan (Catcliffe).

Sheffield.—Transport Committee. Accepted. Electric clocks (£401).—Robert Neill & Co., Ltd.

Assistance Committee. Accepted. Wireless installation at Fir Vale institution (£357).—John Riley & Son.

Sutton Coldfield.—Electricity Committee. Recommended. Two 200-kVA transformers (£267).—General Electric Co., Ltd.

Watford.—Electricity Committee. Recommended. Two transformers (£421).—Metropolitan-Vickers Electrical Co., Ltd.

Worthing.—Electricity Committee. Accepted. Switchgear (£1,011).—W. Lucy & Co., Ltd.

Forthcoming Events

Electrical Trades' Commercial Travellers' Association.—Friday, November 16th. Criterion Restaurant, W.1. 6.30 for 7 p.m. Annual dinner-dance.

Junior Institution of Engineers.—Friday, November 16th. Institution, London. 7.30 p.m. Informal meeting. "High Pressure Boilers." Mr. J. Calderwood.

Midland Electrical Engineers' Ball.—Friday, November 16th. Grand Hotel, Birmingham.

Association of Mining Electrical Engineers.—(*South Wales Branch*).—Saturday November 17th. South Wales Institute of Engineers, Cardiff, 6 p.m. "Some Aspects of Underground Lighting." Mr. W. Davies. Saturday, November 24th. 3 p.m. Official visit to the Engineering Exhibition, Cardiff.

Electrical Power Engineers' Association.—(*London Local Group*).—Monday, November 19th. "Earthing." Mr. F. Leyburn.

Post Office Telephone and Telegraph Society of London.—Monday, November 19th. Institution of Electrical Engineers, W.C.2. 5.30 p.m. "The Ship-Shore Wireless Service." Lt.-Col. C. G. G. Crawley.

Association of Supervising Electrical Engineers.—Tuesday, November 20th. E.L.M.A. Lighting Service Bureau, W.C.2. 7.15 p.m. "Tenth Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings." Mr. W. Lang.

Diesel Engine Users' Association.—Wednesday, November 21st. Caxton Hall, S.W.1. 3 p.m. "Heavy-Oil Engine Performances as Recorded on Log Sheets." Mr. W. A. Tookey.

Institution of Electrical Engineers.—Thursday, November 22nd. Institution, London. 6 p.m. "Generation, Distribution and Use of Electricity on Board Ship." Messrs. C. W. Saunders, H. W. Wilson, and R. G. Jakeman. (*London Students' Section*).—Friday, November 16th. Institution, London. 6.30 p.m. "Remote Control of Power Stations using Automatic Type Telephone Switches." Mr. H. M. Yells. Saturday, November 17th. 2.15 p.m. Visit to the Hewittic Electric Co., Ltd., and the Hackbridge Electric Construction Co., Ltd., Walton-on-Thames. Wednesday, November 21st. Victoria (North) Hall, W.C.1. 8 p.m. Dance. (*Meter and Instrument Section*).—Friday, November 16th. Pagani's Restaurant, W.1. 6.45 for 7 p.m. Annual dinner. (*North-Eastern Students' Section*).—Friday, November 16th. Armstrong Col-

lege, Newcastle-on-Tyne. 7.15 p.m. "Earthquakes, Sun-Spots and Other Disturbances of Radio." Mr. J. F. M. Mellor. Friday, November 23rd. Tilley's Grand Assembly Rooms, Newcastle-on-Tyne. 8 p.m. Annual dance. (*North Midland Students' Section*).—Sunday, November 18th. 10.25 a.m. Visit to the Benzole extraction plant of the Leeds Gas Department. (*North-Western Students' Section*).—Sunday, November 18th. 2 p.m. Visit to the "Capitol" Cinema, Didsbury. (*Mersey and North Wales (Liverpool) Centre*).—Monday, November 19th. The University, Liverpool. 7 p.m. "An Experimental Sequel to Faraday's Work of 1831." Prof. W. Cramp. (*South Midland Centre*).—Monday, November 19th. James Watt Memorial Institute, Birmingham. 7 p.m. "Hydro-Electric Development in Great Britain." Messrs. A. S. Valentine and E. M. Bergstrom. (*Tees-Side Sub-Centre*).—Monday, November 19th. Cleveland Technical Institute, Middlesbrough. 6.45 p.m. Address by Mr. L. E. Mold. (*Western Centre*).—Monday, November 19th. South Wales Institute of Engineers, Cardiff. 6 p.m. "The Fatigue of Metals, with special reference to Diesel Engines and Steam Turbines." Prof. F. Bacon. (*North Midland Centre*).—Tuesday, November 20th. Hotel Metropole, Leeds. "Developments in Long-Distance Telephone Switching." Mr. T. S. Skillman. (*North-Western Centre*).—Tuesday, November 20th. Engineers' Club, Manchester. 7.15 p.m. "A Critical Examination of the Present Practice Relating to the Electrical Warming and Air-conditioning of, and the Supply of Hot Water to, the Larger Buildings." Messrs. R. Grierson and D. Betts. (*Sheffield Sub-Centre*).—Wednesday, November 21st. Royal Victoria Hotel, Sheffield. 7.30 p.m. Paper by Messrs. R. Grierson and D. Betts. (*Transmission Section*).—Wednesday, November 21st. Institution, London. 6 p.m. Address by Mr. R. Borlase Matthews. Friday, November 23rd. Harrod's Georgian Restaurant, Knightsbridge. 8 p.m. Conversazione, supper-dance and exhibition of overhead line equipment.

Birmingham Electric Club.—Friday, November 23rd. Grand Hotel, Birmingham. 7 p.m. "Protection of Electrical Circuits by High Rupturing Capacity Fuses." Mr. A. M. Pooley.

Notes

"An Awkward Situation"

Since our leading article went to press we are given to understand that there is every likelihood of the date of the National Electrical Convention at Bournemouth being changed in order to avoid clashing with the British Industries Fair. The new date is stated to be Monday, June 3rd to 8th, that is, the week following the Fair.

The Generation of Electricity

The official returns rendered to the Electricity Commissioners show that 1,434 million kWh was generated by authorised undertakers in Great Britain during October, 1934, as compared with the revised figure of 1,245 million kWh in the corresponding month of 1933, representing an increase of 189 million kWh or 15.2 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was twenty-seven as against twenty-six last year.

During the first ten months of 1934 up to the end of October, the total amount of electricity generated by authorised undertakers was 12,307 million kWh, as compared with the revised figure of 10,604 million kWh for the corresponding period of 1933, representing an increase of 1,703 million kWh, or 16 per cent.

	1933. kWh. (millions).	1934. kWh. (millions).	Inc. per cent.
January	1,336	1,536	14.8
February	1,151	1,343	16.5
March	1,160	1,390	19.6
April	952	1,187	24.5
May	1,005	1,125	11.9
June	885	1,049	18.5
July	913	1,042	14.1
August	928	1,059	14.1
September	1,023	1,142	11.6
October	1,434	1,245	15.2

The Institute of Fuel

More than 750 members and guests of the Institute of Fuel were present at the eighth annual dinner on Monday at the Connaught Rooms, W.C. The president, Sir Harry McGowan, was in the chair. The toast of "The Institute of Fuel" was proposed by the Duke of Kent, who said that although the Institute was incorporated only in 1927 it had achieved international importance and twenty-nine countries were represented in its membership. It had awarded the Melchett Medal to a German, a Swede, an American, and an Englishman. They were now giving it to a German scientist (Dr. Friedrich Bergius) in recognition of his discovery of methods for the hydrogenation of coal, a new industry which was being more developed in Britain than in any other country.

The President, responding, expressed satisfaction that industrialists were attaching more and more value to research. It was as a result of his research work that Dr. Bergius had been able to extract petrol from brown coal, and the oil companies of America were distilling heavy oils by methods based on his principles. The I.C.I. was building a plant at Billingham for the production of 150,000 tons of petrol per annum at a cost of £3 millions and giving employment to 12,000 people during its construction.

The Duke then presented the Melchett Medal to Dr. Bergius, who made a brief speech of thanks. Sir Wm. Larke proposed "The Visitors," and the Rt. Hon. Oliver Stanley, M.P., responded. The dinner was followed by a cabaret and dance.

The Paris E.H.T. Conference

The 1935 session of this conference will probably be held from June 6th to 15th. The programme will be divided into (*a*) utilisation, interconnection and protection; (*b*) power station and sub-station equipment; (*c*) construction, insulation and maintenance of overhead and underground lines. At the 1933 session there were 751 participants, representing thirty-one countries, a record number in spite of the economic depression then prevailing. It is requested that any British engineer proposing to present a paper coming within the scope of one of the above headings should notify the I.E.E. forthwith, stating the subject of the paper, and subsequently submit the MS through the Institution for transmission to Paris, thus ensuring the desired co-operation with the British National Committee. All communications with regard to papers and attendance at the session should be addressed to the secretary of the Institution of Electrical Engineers.

Magnesium Alloys

Magnesium alloys came to the fore in connection with the construction of aircraft, where weight-strength ratio is of prime importance. The same characteristic has caused their increasing adoption for electrical apparatus, oil and steam engines and other mechanical work. In electric traction the weight saving is reported to be about 3 cwt. per motor, and oil-tight joints for gear cases are more easily secured than with malleable castings. They are also used for portable tools and h.v. switchgear, where a low inertia loading is desirable. In the production of magnesium, two electrolytic processes are employed (depending upon the raw material) known as the chloride and the oxide. The specific gravity of magnesium is 1.8 as compared with 2.7 for aluminium, the thermal conductivity coefficient (c.g.s. units at 10 deg. C.) is 0.32, and the electrical conductivity (copper 100) 25 to 32. Further particulars are to be found in the new edition "Magnesium Alloys," a publication of the Elektron group of companies.

Heavy Current Three-phase Equipment

Exceptionally heavy-current three-phase equipment comprising alternator, connections, and switchgear, has recently been supplied by the Allgemeine Elektricitäts Gesellschaft, Berlin, to a foreign sugar factory. The alternator is rated at 3,500 kVA with an overload capacity of 25 per cent. for two hours. It operates at 220 V and is connected to the bus-bars through an air-break type circuit-breaker. The gear is capable of carrying continuously 9,200 A or 11,500 A for two hours, and is extraordinary inasmuch as such large three-phase capacities are rarely used. According to *A.E.G. Progress* the connections between alternator, main breakers, and bus-bars are of bare copper, and at the alternator end are separated into two parallel branches so as to reduce the skin effect and inductive voltage drop. To prevent the formation of eddy currents, iron circuits have been eliminated and the bus-bar hangers and certain parts of the suspension made of non-magnetic material. Suitable anchorages and flexible expansion pieces allow of free thermal expansion. The alternator breakers take the form of two parallel units, each continuously carrying 6,500 A and designed to break 50,000 A. Each pole consists of three parallel elements with laminated contacts, silvered against oxidation, while each phase includes an exceptionally powerful blowout arc extinguishing device. The actual make-and-break is carried out by this latter element alone. A series-wound motor having a high closing torque is used for remote control, allowing for synchronising and giving the choice of separate or combined operation. The connections lie in two rows, one above the other, and are crossed with the aid of auxiliary bus-bars. Adjustable choke coils attached to each element ensure that the current divides equally between the parallel branches.

Colliery Well Glass Lighting Fittings

The British Standards Institution has issued a revision of the specification for underground lighting fittings for use in mines. It provides for a 60-W non-flameproof well glass for use underground in coal mines in the areas prescribed by the Coal Mines General Regulations (Lighting), 1934, and for use with gasfilled lamps. Copies of the Specification (No. 238-1934) may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

"The Subdivision of the Light"

Mr. A. J. Howard, borough electrical engineer, Taunton, claims that one of the first instances of the lighting of a public hall by electricity was in the national schoolroom at Pitminster, near Taunton. Twenty "Swan" lamps were substituted for paraffin lamps in lighting the stage for theatrical performances, which took place on June 14th, 15th, and 16th, 1882, and a contemporary account draws attention to the reduction in temperature brought about by their means. Mr. F. M. Newton, the founder of the Newton Electrical Works, Taunton, provided the installation (which included an arc lamp at the main entrance) and supplied the current from two dynamos running in parallel.

Appointment Vacant

Mains superintendent for Scunthorpe and Frodingham U.D.C. Electricity Department.

Makers' Names Wanted

WALSTAFF switch plug.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. E. Morgan, general manager of the Sheffield Corporation Electricity Department, has been appointed managing director of the Shropshire, Worcestershire & Staffordshire Electric Power Co. Mr. Morgan was educated at Liverpool University, and received his training with the British Westinghouse Co. After serving with the Yorkshire Electric Power Co., he went to Wolverhampton in 1920 as technical engineering assistant, becoming borough electrical engineer upon the appointment of Mr. S. T. Allen as engineer to the West Midlands J.E.A. While at Wolverhampton he was responsible for a great deal of rural development and for the changing-over of the system from d.c. to a.c. He was appointed chief engineer and general manager at Sheffield in June, 1929. Under his direction the output of the undertaking has increased from 200,000,000 to nearly 300,000,000 kWh per annum, the number of consumers has been more than doubled, and reductions in charges have been made amounting to £115,000 a year. One of the schemes with which Mr. Morgan has been associated is the new Blackburn Meadows power station which was inaugurated in April, 1933. Since that date a new scheme has been decided upon, and plans for increasing the output at Blackburn Meadows and Neepsend power stations are now being carried out which will cost £770,000. Mr. Morgan is a member of the I.E.E., an associate member of the Institutions of Civil and Mechanical Engineers, and is on the Consultative Committee (Mid-East England) of the Central Electricity Board. He is also a member of the Council of the I.M.E.A., and of the E.D.A. Council. He will terminate his duties in Sheffield in February next, when he will take up his new appointment.

[*Yates & Henderson*
Mr. E. Morgan

Guildford Town Council has granted increases of salary to Mr. W. F. May, mains superintendent (from £400 to £450 per annum); Mr. S. F. Whiting, station engineer (from £400 to £440); Mr. R. H. Billing, installations superintendent (from £360 to £400); Mr. C. A. Walker, meter superintendent (from £360 to £370); and Mr. F. G. Tait, assistant mains superintendent (from £327 to £360).

Mr. H. P. Wright was elected chairman of the Junior Institution of Engineers at the annual meeting of the Institution on November 9th, and **Messrs. A. E. Bingham** and **H. G. Pusey** were elected vice-chairmen.

Captain W. M. Blagden, the author of the article on "The Single-Phase Induction Motor," which appears on page 675, was first commissioned in the Royal Engineers at the beginning of 1919, and commenced to specialise in electrical and mechanical work in 1925. For the past three and a half years he has acted as instructor in electrical machinery in the electrical and mechanical branch of the School of Military Engineering, Chatham.

Ald. C. Macfarlane, who has been chairman of the Electricity Committee of West Hartlepool Corporation for the past thirty-two years, has resigned from the Council after forty-five years' service. This period of chairmanship is probably a record for any municipal undertaking in the country. During Ald. Macfarlane's chairmanship the following engineers have served as managers of the undertaking: The late Mr. H. F. Friederichs; Mr. J. W. Spark, now city electrical engineer, Bath; Mr. J. H. Parker, now with the London Passenger Transport Board; Mr. H. E. Blackiston, now borough electrical engineer, Ipswich; and Mr. S. Tillotson. The work of the Electricity Committee put a considerable strain upon Ald. Macfarlane, particularly that part which related to the inception and carrying out of the waste-heat scheme, which saw the erection of the first municipal waste-heat station in the country. He is succeeded by the vice-chairman, Coun. M. Bloom.

Mr. W. T. Rushton, of the Vincent Switchgear Manufacturing Co., Ltd., was elected chairman of the Electrical Trades' Commercial Travellers' Association at the annual meeting of the Association held on November 9th, and **Mr. S. Johnson,** of the General Electric Co., Ltd., was elected vice-chairman.

Mme. Joliot, daughter of the late Mme. Curie, and her husband have been awarded the Jerome Ponti prize by the Académie des Sciences for their discovery of "induced" radio-activity.

Mr. E. A. Newburn, A.M.I.E.E., chief technical assistant with the Walsall Corporation Electricity Department, was appointed manager of the electricity undertaking by the Corporation at its meeting held on Monday last. He succeeds Mr. H. A. Howie, who retired in September last. Mr. Newburn received his technical education at Doncaster Technical College and Sheffield University, and from 1913 to 1916 was a pupil in the Doncaster Corporation Electricity and Tramways Department. He was appointed assistant mains superintendent with Rotherham Corporation Electricity Department in 1916, and left there in 1921 to take up the position of deputy mains superintendent at Rochdale; while he was with that undertaking he was responsible for the installation of the Whitworth and Milnrow U.D.C. undertakings. He was appointed chief technical assistant at Walsall in 1930. Mr. Newburn was for some time lecturer in electrical engineering at Rotherham Technical College, and served two years in the Royal Air Force.

Mr. E. A. Newburn

Mr. G. Bremer, after being with the Times Electrical Co., Ltd., for the last sixteen years, has now joined the staff of the London Commercial Electrical Stores, Ltd., 13, Farringdon Avenue, E.C.4, as representative for the South.

Mr. J. Taylor has been selected from 130 applicants as deputy electrical engineer to Cleethorpes Electric Supply Department. He is at present engaged as mains technical assistant with the Sheffield Corporation electricity undertaking.

At the recent annual meeting of Brook Motors, Ltd., **Mrs. E. Brook,** wife of the managing director, presented gifts to six employés who had completed twenty-five or more years' service with the company. The presentations were as follows: Mr. G. Hirst, a fitter (over thirty years' service), gold watch and chain; Mr. A. Stocks, the chief electrical engineer and a director, a silver tea service; Mr. W. Mills, secretary and a director, a silver lamp; Mr. H. Frith, in charge of the Leeds office of the company, a bureau; Mr. A. Beaumont, chief winder, a silver tea service; and Mr. H. Hewitson, chief mechanical engineer, a bureau.

Lady Moir, the Marchioness of Reading and Lady Mount Temple, at the tenth birthday celebrations of the Electrical Association for Women. Right: Mrs. G. Z. de Ferranti presents a diamond brooch to Miss Haslett. **(See p. 681)**

Mr. E. M. Benjamin, who until recently was secretary to Messrs. Petters, Ltd., has been appointed commercial manager of the North Wales Power Co., Ltd. The *Western Gazette* states that this is a new post which has been created to deal with the rapid expansion of this company.

Mr. T. Stretton, of the Concordia Electric Safety Lamp Co., Ltd., who recently underwent a throat operation, has left the nursing home, and we are glad to hear that he is making good progress.

Mr. D. J. Nolan, power superintendent of the Sydney Municipal Electricity Department, is recommended by the City Electricity Committee for the new position of commercial manager of the Department. Mr. Nolan, who has been in the Council's service for six years, was educated at Melbourne Technical College. Since 1920 he has held positions as a junior engineer with the Victorian Railways, engineer engaged in power station construction and operation in the United States, and engineer in charge of the technical staff of the Victorian Railways.

Mr. A. J. Bailey, who has retired from his position at the Rugby works of the English Electric Co., Ltd., after forty-five years' service, has been presented by his colleagues with a travelling case and an attaché case and a handbag for Mrs. Bailey. Mr. Bailey, after serving his apprenticeship at Ringwood, joined the staff of Willans & Robinson at their works at Thames Ditton, and he was transferred to Rugby when the works there were opened in 1897.

Mr. H. A. Haines, assistant engineer at the Strand generating station, Swansea, has secured an appointment at the power station of Maidenhead Corporation.

Mr. W. Gill, who has represented the North-Eastern Electric Supply Co., Ltd., at Thirsk for the past five years, has been appointed as the company's representative at Malton. Mr. Gill began his service with the company in the lighting and heating department at Carliol House, Newcastle-upon-Tyne, and was appointed to Thirsk in succession to Mr. H. D. Phelps.

Mr. R. J. Yendall, for over thirty-six years mechanical superintendent at the Taunton Corporation power station, has retired on superannuation, and has been presented by his colleagues with an inscribed gold watch.

Electrically minded ladies have worked unstintingly and successfully in a number of small Lancashire towns in connection with the Electrical Association for Women. This was brought home by the farewell meeting at Walkden to **Mrs. J. W. Armstrong,** chairman of the Worsley and District branch of the Association, upon her departure for London. Mrs. J. Fearnley, president of the branch, expressed members' keen regret, but added that Mrs. Armstrong would be a valuable acquisition to another branch. She carries with her a cut-glass biscuit barrel as an expression of members' regard.

Mr. W. J. H. Piper, late superintendent of workshops, G.T.D., Ceylon, has been appointed to the Posts and Telegraphs, Takoradi, Gold Coast, Africa.

Mr. L. W. G. Hetherington, of the Sussex Electricity Supply Co., Crawley, has been appointed assistant in charge of the showroom of the Wimbledon Corporation Electricity Department.

Obituary

Mr. A. W. Szlumper.—The death is announced of Mr. Alfred Weeks Szlumper, formerly chief engineer of the Southern Railway, which occurred on November 11th in his seventy-seventh year. He served his pupilage under his brother, the late Sir James Szlumper, consulting engineer, and subsequently became engineering assistant on the South-Eastern Railway. Later he was appointed resident engineer to the Great Indian Peninsula Railway. He returned to this country in 1883, as resident engineer with the London and South-Western Railway, becoming chief engineer in 1914. On the formation of the Southern Railway in 1924 he was appointed chief engineer, retiring from that position in 1927, since which date his services had been retained in a consultative capacity.

Prof. J. G. Gray.—The death occurred on November 6th of Professor James Gordon Gray, Cargill Professor at Glasgow University, at the age of fifty-eight. He had an international reputation as an expert in gyroscopic work and carried out considerable research on gyroscopes for aerial and marine purposes. He was the son of the late Prof. Andrew Gray, F.R.S., with whom he was joint author of a treatise on dynamics.

Herr M. K. Strecker.—The death occurred recently at Heidelberg, Germany, at the age of sixty-nine years, of Herr M. K. Strecker, who was well known for his work in conjunction with Wernher von Siemens in the establishment of the German Physical Technical Institute and in the development of telegraphic and telephonic apparatus. Prior to his retirement, about ten years ago, he was a member of the International Electrotechnical Commission.

Major J. Mackay.—The death occurred on November 6th, at Kirkwall, of Major John Mackay, who introduced electricity to the Orkneys, and, as electricity convener of Kirkwall Town Council, was responsible for the electrical installation in that town.

Major D. Napier-Whittingham, a director of Power Management, Ltd., died suddenly on Saturday last at the age of 44 years.

Wills.—Sir Clarendon G. Hyde, partner in Messrs. S. Pearson & Son, and a director of the Electric & Railway Finance Corporation, Ltd., and other companies, left £236,174 (net personalty £215,098).

Mr. L. A. Beale, electrical engineer, of Chatham, left £6,046 (net personalty £5,221).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Merlin Radio & Television Relay Service, Ltd.—Private company. Registered November 2nd. Capital, £6,000 in £1 shares. Objects: To acquire the business of distributors and relayers of wireless telegraphy and telephony now carried on by Merlin Radio & Television Relay Service, Ltd. (registered under the Industrial & Provident Societies Acts) at Merlin House, Burry Port, Carmarthen. The directors are: E. G. Rees, Great Western Docks, Llanelly, and four others. Solicitors: G. Tracey Phillips, Ammanford.

Yorkshire Telephone Systems, Ltd.—Private company. Registered November 3rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in telephonic, telegraphic and television apparatus, transmitting and receiving sets, &c. The first directors are: C. T. Callagher, 38, Thirsk Road, S.W.11, and I. Harris, 5, Water Lane, E.C.3. Secretary: I. Harris. Registered office: 5, Water Lane, E.C.3.

Radio & Electrical Mantel Co., Ltd.—Private company. Registered October 29th. Capital, £600 in 500 preference and 100 ordinary shares of £1 each. Objects: To carry on the business of electrical engineers and contractors, radio engineers, mantelpiece contractors, &c. The directors are: B. Clifford, "Utopia," 72, Minster Road, W. Hampstead, N.W.2, and two others. Registered office: 57, Norfolk Avenue, Sanderstead, Surrey.

Rodlite, Ltd.—Private company. Registered November 5th. Capital, £5,000 in £1 shares. Objects: To acquire the business relating to (amongst other things) signs and the like suitable for exhibition and advertising purposes now carried on by or on behalf of Ralph L. Aspden at Shaw Hill, Chorley, as "The Rodlite Sign Co.," and to carry on the business of engineers for advertising and display purposes, electricians, makers of lamps and illuminating devices, signs, &c. The first directors are: G. H. Redman, Levens Lodge, Leyland, Lancs, and two others. Secretary: J. Bradshaw. Solicitors: Cotman & Son, 8, Lune Street, Preston.

Thorne Relay Exchange, Ltd.—Private company. Registered October 31st. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with John I Moulton and to acquire, operate and develop radio relay exchanges in the United Kingdom. The first directors are: J. I. Moulton, 8, Huby Park, Huby, near Leeds, and two others. Registered office: 152, Boothferry Road, Goole, Yorks.

Electrical Relay Co., Ltd.—Private company. Registered October 29th. Capital, £500 in £1 shares. Objects: To establish, maintain and develop services for the relaying of wireless entertainment programmes in any part of Great Britain, Ireland, and the Isle of Man. The first directors are: H. Rose, Hillsdown, Courtenay Avenue, Hampstead Lane, N.6, and S. E. Hunt, 29, Streatley Road, Brondesbury, N.W.6. Registered office: 50, Webbs Road, Clapham Junction, S.W.

Granville Wire Works, Ltd.—Private company. Registered November 7th. Capital, £200 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric cable and wire, electrical fittings and wireless components, &c. The subscribers are: C. Hart, 32, Church Street, Edmonton, N., and G. Wallace, 105, Albert Road, Alexandra Park, Middlesex. Secretary: G. Wallace. Registered office: Granville Park Works, Brettenham Road, Edmonton.

Worksop Radio Relays, Ltd.—Private company. Registered November 7th. Capital, £3,000 in £1 shares. Objects: To erect and maintain wireless signal and receiving stations, &c. The directors are: F. Moss, "Sandridge," Nottingham Road, Mansfield, and L. R. Moss, 6, King Edward Street, Mansfield. Secretary: L. R. Moss. Solicitor: Fred Foster, Ryton Chambers, Newcastle Avenue, Worksop.

S. B. Wainwright & Co., Ltd.—Private company. Registered November 5th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in dynamos, motors, armatures, magnetos, batteries and electrical plant, radio apparatus, &c. The first directors are: S. B. Wainwright, 43, Morley Avenue, Fallowfield, Manchester, and J. A. Stewart, 6, Callender Street, Chorlton-on-Medlock, Manchester. Secretary: R. P. Williams. Registered office: 112, London Road, Manchester.

Rex Hoult, Ltd.—Private company. Registered November 8th. Capital, £200 in £1 shares. Objects: To carry on the business of electrical, wireless and mechanical engineers, contractors and merchants, &c. The first directors are: J. H. Bainbridge, 14, Hawthorn Road, Hollinwood, Oldham, and

J. R. Hoult, 9, Peru Street, Higher Broughton, Manchester. Registered office: 52, Old Street, Ashton-under-Lyne, Lancs.

Western Metropolitan Electric Co., Ltd.—Private company. Registered November 9th. Capital, £1,000 in £1 shares. Objects: To carry on the business of industrial and shop lighting specialists, electricians, mechanical engineers and manufacturers, &c. The directors are: N. F. Bennett and R. A. Bennett, 4, Foscote Road, Hendon. Registered office: 3 and 5, Maddox Street, W.1.

G. K. Jensen & Co., Ltd.—Private company. Registered November 9th. Capital, £5,000 in £1 shares. Objects: To acquire the business now carried on at 106-108a, King Street, Hammersmith, as "G. K. Jensen & Co.," and to carry on the business of electrical, mechanical, constructional, lighting, heating, ventilating, lift, acoustical, power, radio, and general engineers, &c. The directors are: W. C. Hayne, 80, Goswell Road, E.C.1, and two others. Registered office: Capel House, New Broad Street, E.C.2.

Returns of Electrical Companies

Norwood Radio, Ltd.—W. Y. Thomson, 16, Clapham Junction Approach, S.W., was appointed receiver and manager on April 6th, 1934, under powers contained in debentures dated March 16th, 1931, and July 17th, 1931. (Notice filed November 3rd, 1934.)

Wm. E. Gulkin & Co., Ltd.—J. W. Hellewell, 5, Bond Street, Bradford, ceased to act as receiver and/or manager on October 31st, 1934.

Robinson & Hands Electric Co., Ltd.—Debenture dated October 18th, 1934, to secure £8,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd.

Young Accumulator Co. (1929), Ltd.—Mortgage and general charge on Burlington Works, Arterial Road, New Malden, and the company's undertaking and other property, including uncalled capital, dated October 29th, 1934, to secure all moneys due or to become due from the company to the National Provincial Bank, Ltd.

Maxlume Lighting & Heating Co., Ltd.—Mortgage on land with "Arrol Works" thereon in Aston, Birmingham, dated October 20th, 1934, to secure £1,500. Holders: Stonsolie Investments, Ltd., 108a, Cannon Street, E.C.4.

London United Tramways, Ltd.—(In liquidation).—Satisfaction in full (1) on September 5th, 1916, of second mortgage dated August 16th, 1907, and registered August 20th, 1907, securing £300,000. (2) on June 20th, 1919, of debentures authorised April 3rd, 1917, and registered February 28th, 1918, securing £68,000, and (3) on same date of debentures authorised April 3rd, 1917, and registered February 28th, 1918, securing £33,000. (Notices filed October 31st, 1934.)

Economic Electric Co. (Liverpool), Ltd.—Capital, £10,000 in £1 shares. Return dated September 22nd, 1934. 8,300 shares taken up. £8,300 considered as paid. Mortgages and charges: £2,975 12s. 5d.

Vincent Switchgear Manufacturing Co., Ltd.—Capital, £10,000 in £1 shares. Return dated September 26th, 1934. 7,948 shares taken up. £7,948 considered as paid. Mortgages and charges: £3,000.

L. W. Douthwaite & Co., Ltd.—Capital, £7,000 in £1 shares. Return dated September 29th, 1934. 5,519 shares taken up. £1,321 paid, £4,198 considered as paid. Mortgages and charges nil.

Ellis & Mort, Ltd.—Capital, £20,000 in £1 shares. Return dated September 12th, 1934. 15,000 shares taken up. £10,120 paid, £4,880 considered as paid. Mortgages and charges nil.

Caradio Services, Ltd.—The nominal capital has been increased by the addition of £500 in £1 ordinary shares beyond the registered capital of £500.

Community Radio (1928), Ltd.—Issue on October 9th, 1934, of £1,150 debentures, part of a series already registered.

Climax Radio Electric, Ltd.—Capital, £8,000 in 4,000 "A" and 4,000 "B" shares of £1. Return dated December 13th, 1933 (filed July 13th, 1934). 3,590 "A" and 2,000 "B" shares taken up. £2,418 10s. paid on 418½ "A" and 2,000 "B" shares, £3,171 10s. considered as paid on 3,171½ "A" shares. Mortgages and charges nil.

Oxford Radio Supplies, Ltd.—Capital, £1,500 in £1 shares. Return dated September 24th, 1934. 1,400 shares taken up. £1,400 paid. Mortgages and charges nil.

Radio & Accessories (1933), Ltd.—Debenture dated October 20th, 1934, to secure £600, charged on the company's undertaking and property, including uncalled capital. Holders: L. Apple, Ltd., 13, Brewer Street, W.1.

Drury Radio Co., Ltd.—Capital, £2,000 in £1 shares. Return dated August 16th, 1934. All shares taken up. £2,000 paid. Mortgages and charges nil.

Boxer Radio Co., Ltd.—Capital, £550 in £1 shares. Return dated August 29th, 1934. 501 shares taken up. £453 10s. paid (£1 on 451 and 1s. on 50 shares). Mortgages and charges nil.

John Hearson & Co., Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 ordinary shares beyond the registered capital of £2,000.

M. C. Dizer, Ltd.—The nominal capital has been increased by the addition of £5,000 beyond the registered capital of £10,000. The additional capital is divided into 5,000 6 per cent. preference shares of £1 each.

Batterylife, Ltd.—A. Rosenberg, 4, Paradise Street, Sheffield, was appointed receiver and manager on October 19th, 1934, under powers contained in instrument dated December 20th, 1933.

George Nobbs, Ltd.—C. Waller, 27, Fitzroy Square, W.1, was appointed receiver and manager on November 5th, 1934, under powers contained in instrument dated October 4th, 1932.

Ecco Radio, Ltd.—Capital, £3,000 in £1 shares. Return dated September 17th, 1934. 2,397 shares taken up. £2,397 paid. Mortgages and charges, nil.

East Midland Electrical Co., Ltd.—Capital, £1,500 in £1 shares. Return dated October 17th, 1934. 750 shares taken up. £750 paid. Mortgages and charges, £3,000.

Precision Electric, Ltd.—Capital, £500 in £1 shares. Return dated October 18th, 1934. All shares taken up. £500 paid. Mortgages and charges, nil.

Warren Brothers (Middlesbrough), Ltd.—Capital, £20,000 in 16,000 ordinary and 4,000 deferred shares of £1 each. Return dated October 3rd, 1934. 8,030 ordinary and 4,000 deferred shares taken up. £7,904 paid on 7,904 ordinary shares. £4,126 considered as paid on 126 ordinary and 4,000 deferred shares. Mortgages and charges, £1,200.

Edward Dewhurst, Ltd.—Capital, £20,000 in £1 shares. Return dated September 10th, 1934. 15,672 shares taken up. £1,502 paid. £14,170 considered as paid. Mortgages and charges, nil.

City Notes

Brook Motors, Ltd., held its annual meeting recently, when Mr. E. Brook (managing director) said that the company had had a successful year, the turnover amounting to £145,941. The total number of £1 shares issued was 57,835. The bonus on the preference shares was 10 per cent., and the bonus allowed to employés who held redeemable preference shares was two shares for each five held. During the year ended September 30th 11,281 motors were sold. This was a record. A further record was established in October, for during the month 1,282 motors were sold.

The Chloride Electrical Storage Co., Ltd., has announced an interim dividend on the "A" and "B" ordinary shares of 5 per cent. (same). The directors state that the progress of the company and of its associated companies so far during the current financial year has been maintained. Trading continues to be subject to the influence of many factors, but the immediate prospects are satisfactory. Since the last annual meeting Mr. H. W. Lee has been elected to a seat on the board.

The Shropshire, Worcestershire & Staffordshire Electric Power Co. is holding an extraordinary meeting on November 27th to consider resolutions authorising an increase of capital. It is proposed to create 500,000 shares of £1 each to be called "B" ordinary shares which will rank *pari passu* with the existing "B" ordinary shares.

The South Wales Electric Power Co. is holding an extraordinary meeting on November 27th, when a resolution will be considered for the creation and issue of £322,150 of new ordinary stock.

The British Electric Traction Co., Ltd., has declared interim dividends of 3 per cent. on the 6 per cent. cumulative participating preference stock, 4 per cent. on the 8 per cent. non-cumulative preferred ordinary stock, and 2½ per cent. on the deferred ordinary stock (all unchanged).

W. T. Henley's Telegraph Works Co., Ltd., has decided to give formal notice to the debenture stockholders that it intends to redeem the whole of the outstanding 4½ per cent. debenture stock at the price of £105 per cent. on June 1st, 1935, with interest to that date.

The Anglo-Portuguese Telephone Co., Ltd., has declared an interim dividend on the old ordinary shares of 3 per cent. (same), less tax at 3s. 8d., and an interim dividend on the new ordinary shares of 2.275 per cent. actual, less tax at 4s. 6d.

John Ismay & Sons, Ltd., have declared an interim ordinary dividend of 10 per cent. The directors have decided to offer 200,000 ordinary 1s. shares to ordinary shareholders at 3s. each in the proportion of one new share for every five shares held.

Edmundson's Electricity Corporation, Ltd.—The results of the operations of the Edmundson group of companies during October as compared with the corresponding month of 1933, show an increase of 15 per cent. of kWh sold.

Johnson & Phillips, Ltd.—It is announced that the issue to shareholders of 100,000 ordinary shares of £1 each at 24s. per share has been heavily oversubscribed.

The Delhi Electric Supply & Traction Co., Ltd., has announced an interim dividend of 4 per cent. tax free (same).

Stocks and Shares

TUESDAY EVENING.

THE weekly record continues to be one of advancing prices and increasing scarcity of stock in all cases where purely investment issues are concerned. It is a long time, however, since our list of prices in the Home electricity companies has shown so many improvements within a single week. By reference to the table overleaf, it will be seen that the gains range from 6d. to 2s. in the ordinary shares of the London and the Provincial companies. The advance is due less to a sudden rush to buy shares than to spectacular rises in gilt-edged securities that have followed upon the cheapening of money rates, and the difficulty of acquiring any stocks and shares that will give a living rate of interest on the money. On the rises which have taken place in the London shares, it will be observed that the yield at current quotations has fallen below 4 per cent. In view of the talk which is current nowadays, and for which there is practical justification, that the credit of the country is likely to move on to a basis of 2½ per cent. yield, the prices of electricity supply shares can hardly be regarded as extravagant.

In the group of London shares, improvements have occurred in the ordinary issues of the Charing Cross, Chelsea, City of London, County, Kensington, Metropolitan and St. James'.

Amongst the Provincial shares, Bournemouth & Poole recovered their last week's decline, and advances have taken place in the ordinary shares of the Northampton, Midland Counties and Yorkshire companies. Clyde Valley ordinary are 2s. to the good, and Scottish Power are a shilling up. It may seem superfluous to set out these gains in detail when they are given in our customary table. This special mention, however, may fortify the argument, so frequently adumbrated here, that the ordinary shares of the best electricity supply companies may be called gilt-edged, in the industrial groups of stocks and shares. The prospective buyer of to-day, moreover, is by no means certain of being able to secure what he may select from those just mentioned. The scarcity of supply is more than ever marked, and the question is heard daily as to how far the rise can proceed before it is brought up by some unexpected turn.

Electrical " Babies "

The Kensington & Knightsbridge Electric Lighting Company announces that application is to be made to the Court for amendment of its memorandum of association in such manner as will permit of the subsidiary Ken Bridge Estates to be given a guarantee by the parent company that will cover principal and interest on new debentures which Ken Bridge Estates may issue. The latter company proposes to erect a block of flats on the site adjoining the head office of the Kensington Company, much in the same way as the Chelsea Electricity Company has a subsidiary, Chesil Court, which owns a block of flats built on the Chelsea company's land. Probably other London companies will follow suit.

The holder of shares in these companies, and all other gilt-edged stocks too, may rest comfortably in the assurance that, so far as can be seen at present, no indications exist of any material restraint being laid upon the aspiring course of prices. There is always, of course, the political situation to be taken into account, and the ultra-cautiously minded folk hint darkly at what might be the consequence of a General Election in which the present Government would be overturned. The prospect of such a thing appears to be too unlikely for it to deserve more than casual reference.

Public Boards' Stocks

The same conditions which apply to first-class ordinary industrial shares relate also to the gilt-edged stocks of the public boards. The feature amongst these issues is a further advance to 4¼ premium in the recently-issued stock of the Central Electricity Board, which bears 3½ per cent. interest, and came out at 93 recently. London Passenger Transport securities are all higher, the "C" stock gaining 3 points at 90 and the prior charge issues being also advanced from 3 to 4. The pre-ordinary stocks of the railway companies have been going up by points a day, which to the holder of the stocks affords a satisfaction more abstract than real, in that, although it is pleasant to see the value of investments improving, the fixity of the interest gives the stockholder no fresh income, and is but of indirect value to him.

Cables and Wireless

The disappointing section in the industrial market is that for Cables and Wireless stocks. The preference has advanced a point to 76, but there is no particular public demand either for this or the two ordinary stocks. Globe ordinary remain at 9⅜; the preference are ⅛ up at 12⅜. The latter offer 4¾ per cent. yield on the money, which is not a bad return in present-day circumstances from shares which may be regarded as reasonably sound. American Telephone and Telegraph put on 3 points to 113½ in the general improvement in American stocks and shares which followed upon the result of the recent elections in the United States. Anglo-American Telegraph preferred and deferred stocks are both higher, reflecting investment demand. Marconi Marines remain dull at 31s. 3d.

Manufacturing and Equipment

Amongst the features in the market for electrical manufacturing and equipment shares, a rise in Johnson & Phillips new shares stands out as noteworthy, the price advancing to 6s. 3d. premium. The old shares have strengthened to 30s. Enfield Rolling Mills have been in demand, a substantial buying order, coming upon a market short of shares, sufficing to put up the price to 26s. The shares of the parent company, Enfield Cable, are better at 4¹⁵⁄₁₆. Henleys drooped to 6¼. Crompton Parkinsons continued their progress with 1s. rise to 34s. On the other hand, Brush ordinary has fallen 2¼ to 40½. The Associated Equipment Company is to pay a dividend of 10d. per unit on £1 stock, which, with the interim dividend, makes approximately 8⁷⁄₁₆ per cent. actual for the year, subject to tax. The price of the units has improved to 35s. Associated Electrical Industries preference came into demand, and at 33s. 9d. show a 1/16 rise. General Electrics are 1s. 9d. better at 47s. 6d. Ericssons have jumped to 96s. 3d. British Insulated firmed up to 76s. 3d.

A new introduction to the market is the 6 per cent. cumulative preference issue of the General Cable Manufacturing Co., Ltd. These shares are of 10s. each, and the price is quoted at 10s. 9d. middle.

After last week's rise of 4s. in Babcock & Wilcox shares, the price has gone back a trifle to 46s. 6d. Other shares in this department show, however, a steady tone as a whole. The latest figures published by the Home Railway companies and other indications suggest that trade is steadily progressive.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Nov. 13.	Rise or Fall.	Yield. £ s. d. p.c.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	78/9	+⅛	3 16 2
Brompton Ordinary	1	7	7	34/6	—	4 1 2
Charing Cross Ordinary	1	7	7	35/6	+6d.	3 19 0
Chelsea	1	7	7	35/6	+1/-	3 19 0
City of London	1	7½	7½	37/6	+6d.	4 0 0
Clyde Valley	1	7	7	42/-	+2/-	3 6 8
County of London	1	10½	10½	57/6	+1/6	3 12 4
Edmundson's 7% Pref.	1	7	7	36/-	—	3 17 9
Elec. Dis. Yorkshire	1	9	9	50/-	+6d.	3 12 0
Elec. Supply Corporation	1	11	11	58/9	—	3 14 10
Kensington Ordinary	1	7	7	35/6	+1/-	3 19 0
Lancs Light and Power	1	7	7½	38/6	+1/-	3 18 0
London Electric	1	7	7	34/6	—	4 1 2
Metropolitan	1	10	10	54/6	+1/6	3 13 3
Midland Counties	1	7	7	39/-	+2/-	3 11 10
Mid. Elec. Power	1	8	8	48/9	—	3 5 7
North Eastern Electric Ordinary	1	6	6	35/-	+1/6	3 8 7
Do. 7% Pref.	1	7	7	35/-	—	4 0 0
Northampton	1	10	10	57/-	+2/-	3 10 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 4
North Met. Elec. Ordinary	1	10	10	3½	—	3 1 6
Do. do. 6% Pref.	1	6	6	31/6	—	3 16 2
St. James' and Pall Mall	1	7	7½	37/-	+6d.	4 1 2
Scottish Power	1	8	8	42/6	+1/-	3 15 2
South London	1	7	7	35/6	—	3 19 0
Westminster Ordinary	1	7	7	35/6	+1/-	3 19 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/-	—	7 2 10
Yorkshire Elec.	1	8	8	47/6	+1/-	3 7 6
Public Boards.						
Central Electricity, 1950–70	Stock	5	5	115	—	4 7 0
Do. 1955–75	„	5	5	118	+1	4 4 9
Do. 1951–73	„	4½	4½	111	+1	4 1 1
Do. 1963–93	„	—	3½	100	—	3 10 0
London & Home Counties, 1955–75	„	4½	4½	112	—	4 0 4
London Passenger Transport, A...	„	—	4½	124½	+3	3 12 4
Do. do. B...	„	—	5	129	+4	3 17 6
Do. do. C...	„	—	3	90	+3	3 6 8
West Midlands Joint Elec. 1948–68	„	—	5	115	—	4 7 0
Telegraph and Telephone.						
American Tel. & Tel.	$100	9	9	113½	+3	7 18 7
Anglo-Am. Tel. Pref.	Stock	6	6	116½	+2½	5 3 0
Do. Def.	„	1½	1½	29	+1	5 3 5
Cables & Wireless 5½% Pref.	„	2¾	2¾	76	+1	3 12 5
Do. A. 7½% Ord.	„	Nil	Nil	16½	—	—
Do. B. Ord.	„	Nil	Nil	7	—	—
Globe Tel. and T. Ord.	10	Nil	2½	9⅜	—	2 12 0
Do. do. Pref.	10	6	6	12⅜	+⅛	4 15 0
Great Northern Tel.	10	20	20	37	+⅛	5 8 1
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	3½	—	*3 13 10
Home and Foreign Trams, Etc.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	„	5	5	855	—	—
Do. do. Pref. Ord.	„	8	8	165½	—	4 16 10
Brazil Traction	100	—	—	11½	+⅛	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	106	—	4 14 3
Mexico Trams, 5% Bonds	—	5	5	20½	-1	—
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds	—	5	5	40	—	—
Victoria Falls Ord.	1	15	20	6⅜	—	3 2 7
Yorkshire (West Riding)	1	2½	5	25/-	—	4 0 0
Manufacturing Companies.						
Aron Electricity Ord.	1	10	10	71/3	—	2 16 2
Assoc. Elec. Ord.	1	4	3	22/-	—	2 14 7
Do. Prf.	1	8	8	33/9	+⅛	4 14 10
Babcock & Wilcox	1	9	6	46/6	-6d.	2 11 8
British Aluminium Ord.	1	5	5	29/6	—	3 7 9
British Insulated Ord.	1	15	15	76/3	+⅛	3 18 9
Brush Ord.	Stock	Nil	Nil	40½	-2½	—
Callender's	1	15	15	3½	—	4 12 4
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord.	5/-	22½	12½	34/-	+1/-	1 16 10
Do. 8% Pref.	1	8	8	33/9	—	4 14 10
Edison-Swan 1st Pref.	1	7½	7½	22/6	—	6 13 4
Electric Construction	1	Nil	Nil	13/9	—	—
Enfield Cable Ord.	1	25	20	4¹¹⁄₁₆	+⅛	4 5 3
English Electric	1	Nil	Nil	5/9	—	—
Do. do. Pref.	1	Nil	Nil	8/9	—	—
Ever Ready	5/-	35	35	27/3	—	6 8 5
Ferranti Pref.	1	7	7	28/-	—	5 0 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	47/6	+1/9	3 7 6
Henley's	1	30	30	6½	-⅛	4 12 4
Do. 4½% Pref.	5	4½	4½	5⅝	—	3 18 8
India-Rubber Preferred	1	—	—	1	—	—
Johnson & Phillips	1	5	5	30/-	+½	3 6 8
Siemens Ord.	1	6½	4	18/9	—	4 5 4
Telegraph Construction	£1	Nil	Nil	1½	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered atent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

845. "Means for controlling the voltage or current of mercury arc rectifiers or like discharge devices." General Electric Co., Ltd., and H. H. Renner. January 10th, 1933. (417921.)

999. "Electric follow-up and remote-control systems." perry Gyroscope Co., Inc., F. L. Moseley and R. H. Nisbet. January 11th, 1933. (417995.)

4192. "Devices for use in telephone systems for automatically transmitting and recording messages." Dr. K. Daniel. May 21st, 1932. (417924.)

4412. "Thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. February 11th, 1932. (417132.)

6920. "Electric transformers." General Electric Co., Ltd., H. C. Turner and A. Sherwin. March 7th, 1933. (418063.)

7568. "Evacuating arrangements for vapour-arc convertors." General Electric Co., Ltd., and E. Gallizia. March 13th, 1933. (418205.)

7979. "Coaxial-conductor electric cables and the manufacture thereof." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). March 16th, 1933. (417929.)

8386. "Sparking-plugs for internal-combustion engines." A.C.-Sphinx Sparking Plug Co., Ltd., N. F. Stockbridge and D. H. Corbin. March 20th, 1933. (418207.)

10349. "Television apparatus." Telefunken Ges. für Drahtlose Telegraphie. April 6th, 1932. (417932.)

10668. "Sound-wave attenuating apparatus." General Motors Research Corporation. September 15th, 1932. (417935.)

11167. "Electric incandescent lampholders and like fittings." J. M. Brown. April 13th, 1933. (418000.)

11181. "Detection of electrical leakage." C. H. L. George. April 13th, 1933. (418064.)

11377. "Traffic-control systems." Automatic Electric Co., Ltd., A. P. B. Renshaw, and D. Wright. April 18th, 1933. (418070.)

11452. "Wireless receiving apparatus." Pye Radio, Ltd., and E. V. Root. April 19th, 1933. (417947.)

11474. "Radio re-diffusion systems or the like." Standard Telephones & Cables, Ltd., K. E. Latimer, and A. R. A. Rendall. April 19th, 1933. (418138.)

11475. "Envelopes for vapour-electric discharge devices." British Thomson-Houston Co., Ltd., H. Cheney and L. J. Davies. April 19th, 1933. (418220.)

11544. "Electrostatic machines." G. Landwerlin. May 6th, 1932 (Cognate application 11545/33). (418140.)

11673. "Electric signalling or remote-control systems." General Electric Co., Ltd., and B. F. Moss. April 21st, 1933. (418225.)

11674. "Telephone systems." General Electric Co., Ltd., and B. F. Moss. April 21st, 1933. (418004.)

11704. "Method and means for operating electric current-converting discharge apparatus." Allmänna Svenska Elektriska Aktiebolaget. April 25th, 1932. (418144.)

11814. "Electrical safety switching devices for vehicles." G. W. R. Howard and P. W. Dunn. April 22nd, 1933. (Cognate application 7583/34.) (418232.)

13167. "Process and apparatus for recording electrical impulses." W. Koreska. May 7th, 1932. (Cognate applications, 13168/33, 13169/33, 13170/33 and 13171/33.) (417958.)

13621. "Electric leakage indicators and protection devices electrically driven vehicles." General Electric Co., Ltd., and F. C. F. Phillips. May 10th, 1933. (417960.)

14591. "Electric heating elements." International General Electric Co., Inc. May 20th, 1932. (418155.)

14772. "Electric cooking apparatus." W. Needham and Associated Electrical Industries, Ltd. May 22nd, 1933. (418010.)

14870. "Electric motors." A. E. Morrison & Sons, Ltd., A. E. Morrison and A. C. Morrison. May 23rd, 1933. (418,236.)

15581. "Thermionic valves." A. E. F. Thomas and C. E. Thomas. May 30th, 1933. (418238.)

15626. "Electric trolley wires." London Electric Wire Co. & Smiths, Ltd. and E. L. Wildy. May 30th, 1933. (418016.)

16094. "Method of and apparatus for flash butt electric welding." Kabushiki Kaisha Kawasaki Zosensho (Kawasaki Dockyard Co., Ltd.) October 4th, 1932. (418018.)

16784. "Electrically-driven machines for use in drilling or boring in coal, stone, or other substances." F. W. Hurd. June 12th, 1933. (Cognate application 33740/33.) (418020.)

16815. "Electric liquid heaters." Burnley Components, Ltd., and D. K. Ward. June 13th, 1933. (418242.)

17677. "Combined spring-clip contact and terminial for electrical apparatus." A. P. Lundberg & Sons, Ltd., and G. Pegg. June 21st, 1933. (418244.)

18738. Gaseous electric discharge devices." British Thomson-Houston Co., Ltd. July 1st, 1932. (418027.)

20177. "Wireless receiving apparatus." L. G. Fuller. July 17th, 1933. (418033.)

23666. "Terminals for electric accumulators." Chloride Electrical Storage Co., Ltd., and H. Deans. August 25th, 1933. (418042.)

24080. "Electric discharge devices." General Electric Co., Ltd., A. G. Pearce and J. W. Ryde. August 30th, 1933. (Cognate application 2490/34.) (418251.)

25000. "Electrical relay systems." J. J. V. Armstrong (Weston Electrical Instrument Corporation). September 9th, 1933. (418252.)

25782. "Means for supplying direct current alternatively flowing in one or the other direction to a direct-current electric motor by means of a remote control." Marklin et Cie Ges. Geb. and R. Safft. September 18th, 1933. (418081.)

32330. "Electric lampholders, thermionic-valve sockets and the like." R. Loew and E. Lazar. November 20th, 1933. (418090.)

32345. "Electric switches in automatic-pressure regulators." British Thomson-Houston Co., Ltd. November 19th, 1932. (418051.)

34453. "Means for introducing into distribution systems frequencies differing from that of the system." British Thomson-Houston Co., Ltd. December 7th, 1932. (418267.)

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7144. "Rotary visual means for indicating the positions of electric switches or other movable members." British Thomson-Houston Co., Ltd. March 6th, 1933. (418106.)

8586. "Gasfilled electric incandescent lamp." Vereinigte Gluhlampen und Electricitäts Akt.-Ges. April 20th, 1933. (418173.)

8968. "Small self-starting synchronous electric motor." Landis & Gyr Akt.-Ges. March 31st, 1933. (418174.)

11694. "Electric heating plates." British Thomson-Houston Co., Ltd. April 18th, 1933. (418114.)

12830. "Apparatus for radio reception and gramophone reproduction." Telefunken Ges. für Drahtlose Telegraphie. May 11th, 1933. (418117.)

14176. "Electric lamps." British Thomson-Houston Co., Ltd. May 11th, 1933. (417986.)

15700. "Electric cut-out or protective systems." Westinghouse Electric & Manufacturing Co. April 15th, 1932. (Divided application on 10978/33.) (418060.)

16429. "Electric control or indicating systems." H. Baron (A. G. Fitzgerald). January 6th, 1933. (Divided application on 34584/32.) (418273.)

17769. "Electric generators particularly applicable for use in electric arc welding." Sunderland Forge & Engineering Co., Ltd., and J. W. Davison. June 15th, 1934. (418193.)

20257. "Electric arc lamps." General Electric Co., Ltd. August 24th, 1933. (418128.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 7th :—

Harlie (lettering and design). No. 553543. Class 8. Radio telephonic apparatus and parts thereof, &c.—Harlie, Ltd., 3, Balham Road, Lower Edmonton, N.9.

Defiant (lettering and design). No. 553641. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Co-operative Wholesale Society, Ltd., 1, Balloon Street, Manchester.

N (lettering and design). No. 551044. Class 13. Electric lamps (ordinary).—International Lamps, Ltd., 173-175, Farringdon Road, E.C.1.

Power Plant Delivered by Air

A FEATURE of a small hydro-electric power station which is being established on the Bulolo River in New Guinea by the Bulolo Gold Dredging Co., Ltd., is that the plant had to be entirely conveyed to the site by means of aeroplanes. After gold had been discovered in this region in 1925 and the richer veins worked out by hand by prospectors who conveyed their "take" through the jungle on the backs of natives, it became evident that placer operations on a large scale would pay if dredges and other machinery could be installed.

The great difficulty, however, was that of the transportation of the necessary equipment. Although the distance from the sea coast is only about forty miles, there are practically no roads, the terrain consisting of dense, almost impassable and cannibal-infested jungle, with a mountain range the peaks of which rise to 13,000 ft.

The feasibility of using air transport having been investigated, a flying field was cleared and levelled to accommodate large heavily loaded aeroplanes, and then began the slow process of flying in, piece by piece, specially designed mining equipment, including two large dredges. It was necessary to reduce the size and weight of some parts of the heavier equipment so that they could be carried, as the aeroplanes had a load limit of 3 tons 2¼ cwt. and their hatchways measured 11 ft. 8 in. by 5 ft. with a normal inside height of 5 ft. 10 in. The cabins, which had a minimum height of 4 ft., would accommodate any long narrow packages up to 24 ft. in length which could be threaded through the hatches. All packages, however, had to be small enough to leave a 12 in. clearance all round.

Subsequently it was decided to utilise the water power of the River Bulolo for the generation of electricity, the necessary plant being ordered in the United States from the International General Electric Co. The equipment comprises four 875-kVA sets of horizontal turbines and alternators designed for an a.c. output at 11,500 V and 600 r.p.m. (50 cycles), and it was recently shipped from San Francisco. The largest single pieces of the machines are the stators, which have a net weight of 2 tons 9 cwt. Most of the boxing had to be removed and special skids prepared before the stators could be flown to the mining camp. Other apparatus taken to the site of the power station include a complete switchboard, several small lighting transformers, and a 60-cell storage battery, all of which could be readily separated into small units of relatively little weight.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bebington (CHESHIRE).—Church, Old Chester Road; R. Owen. Shops, New Chester Road; Hamilton Estates.

Birmingham.—Block of shops, Shirley Road, Hall Green; H. Dare & Son, Ltd., builders, 962, Alum Rock Road, Ward End, 8. Additions to Hovis, Ltd., Moseley Road; S. W. Swift & Sons, builders, Alcester Street.

Blyth.—School, Kitty Brewster; borough engineer.

Bournemouth.—Cinema, Charminster Road; A. C. Barnes & Co., builders.

Braintree.—Houses (60), St. Peter's Road, Coggeshall; R.D.C. surveyor.

Bramhall (CHESHIRE).—Tudor theatre (electrical work); William Briggs & Co., builders, Stockport.

Bristol.—Baths, Talbot Lane and Whitefield Road (£45,000); borough engineer.

Brynmawr.—Houses (52); U.D.C. surveyor.

Burnley.—Houses (304), bungalows and flats; borough surveyor.

Canterbury.—Houses (162), Thanington, and 132, Vauxhall Farm site; city engineer.

Carn Brea (CORNWALL).—Building for the Cornwall Electric Company (£9,935); Trounson & Son, Penzance.

Caterham.—Alterations and additions to Caterham Hill School (£12,830); Cropley Bros., Ltd.

Chelmsford.—Power, test, and television buildings for Marconi's Wireless Telegraph Co., Ltd.

Chertsey.—Rehousing scheme, Arterial Road (£22,986); S. E. Moss & Sons, Chelmsford.

Cheshire.—County offices, Chester Castle; County architect.

Chesterfield.—Houses (54), Grassmoor; Houfton & Kington, architects, Market Place. Houses, London Road; Rollinson & Son, architects. Municipal buildings (£120,000), Rose Hill Estate; borough surveyor. Works extension, Sheffield Road; Lamp Caps, Ltd.

Colwyn Bay.—Maternity home, Plas Tirion; U.D.C. surveyor.

Crayford (KENT).—Houses (78), by direct labour; U.D.C. surveyor.

Doncaster.—Fire station and firemen's quarters (electrical work), Intake Estate; borough surveyor.

Edinburgh.—New Government Buildings, Calton Hill site (£425,000); Thomas S. Tait of Sir John Burnet, Tait, & Lorne, architects, 1, Montague Place, Bedford Square, London, W.C.1.

Exeter.—Extensions to Princess Elizabeth Orthopædic Hospital; Institution's surveyors, R. M. Challice & Son, 7, Bedford Circus.

Fareham.—Houses (114), Portchester and elsewhere; U.D.C. Plans and Town Planning Committee.

Guildford.—Houses (100), electrical work, Bannisters Farm Estate, for H. Ashenden.

Halstead (ESSEX).—Houses (28), Fenn Road; W. Lee, builder.

Harrow.—Houses (88), Byron Estate; E. B. Burge, Ltd. Houses (42), Marlborough Hill; Lambert & Cooke. Houses (46), Morley Crescent; Taylor Woodrow, Ltd. Houses (31), Park Mead; P. Smirk & Son (Builders), Ltd. Houses, Locket Road and Talbot Road; J. Searoy. Council Offices, Knynaston Court; U.D.C. surveyor. Shops (36) and flats, Shaftesbury Avenue, for Warwick Estates, Ltd.; Marshall & Tweedy.

Hazel Green (CHESHIRE).—Cinema, Woodford Road; C. Catlow.

Helensburgh.—Houses (82); burgh surveyor.

Hereford.—Houses (52), Hinton Court Estate; borough engineer.

Hertfordshire. — Isolation Hospital extensions, Barnet (£20,000); Isolation Hospital Committee.

Hitchin.—Houses (28) and bungalows; A. E. Passingham, clerk, 9, Bancroft.

Kent.—Nurses' home and infirmary extensions, Thanet Institution, Minster; county architect, Maidstone. Technical college, Dartford, for County E.C.

Kirkcudbright.—Houses (60); burgh surveyor.

Leeds.—Houses, Ashby View Road and Ashby Road; W. Morgan. Houses (1,000), housing schemes; City engineer. Houses (284), flats and shops, Dewsbury Road Estate; borough engineer.

Leicester.—Cinema, Melton Road, for H. D. Moorhouse Circuit, Imperial Buildings, Oxford Road, Manchester; H. A. Yearsley, architect, Imperial Buildings, 7, Oxford Road, Manchester.

Lincoln.—School (£10,700), Mount Street, for City E.C.; director of education.

London.—(BERMONDSEY).—Remodelling of County Secondary School (£19,000); L.C.C. architect. (ELTHAM).—School, Briset Road (£24,645); Ashford Builders, Ltd., Bloomsbury Place, W.C. Elementary school, Middle Park Estate; L.C.C. architect. (KILBURN).—Cinema, Willesden Lane and High Road, for H. & G. Kinemas, Ltd. (LEWISHAM).—School, Honor Oak Estate (£24,272); H. & J. Taylor. (POPLAR).—Rebuilding the Grand Palace Cinema, Robinhood Lane; C. Brett, architect, Newlynne, Waxwell Lane, Pinner. (WOOLWICH).—Enlargement to Wickham Lane School (£16,650); L.C.C. architect.

Luton.—Houses (69), Lancot Hill, Totternhoe, for the Garden Development Co.

Marlow.—Development scheme, including cinema, swimming bath, and shops, Marlow Place Estate; C. P. Lovell, Gerrard's Cross.

Merthyr Tydfil.—Houses (280); borough architect.

Middleton (LANCS).—Houses (100), borough surveyor. Primary school, Boarshaw, for Borough E.C.; director of education.

Newburn-on-Tyne.—Houses (158), Throckley Bank Top; Drivers Jonas & Co., builders.

Newcastle-on-Tyne.—Municipal buildings, corner of Jesmond Road (£300,000), for C.C. New sewage disposal works (£20,000), Benwell; Major J. W. Steele, city engineer, Town Hall.

Northampton.—Houses (31), Boughton Green Road, &c.; Chowns, Ltd.

Norwich.—Extensions to Mental Hospital (£27,569); R. G. Carter, Ltd., Drayton.

Nottinghamshire.—Institutions, Balderton Estate (£240,000), and at Blidworth; County surveyor. Senior school, Cavendish Road, Carlton, for County E.C.

Oxford.—Country club, East Oxford (£250,000); Sir Michael Sadler.

Pinner.—Houses (48), Towers Estate; Howell & Burgess (London), Ltd.

Plymouth.—Abattoir, &c., Prince Road (£40,000); city engineer.

Portsmouth.—Houses (76), Portsdown Hill; borough engineer.

Ramsbottom.—Houses (34), Dundee Estate; Baker & Foster, builders, Burnley.

Redditch.—Houses (50), Beoley Road; borough engineer. Houses (100), Salters Lane Estate; U.D.C. surveyor.

Rochdale.—Houses (96), Brimrod Estate; borough surveyor.

Romford.—Houses (36) and flats, Rush Green; Council's surveyor. Cinema, South Street; New Victory Cinema Co., Ltd. Houses (26), Orchard Road; Taylor & Co.

Ross-on-Wye.—Houses (70), Tudorville; U.D.C. Housing Committee.

Rothesay.—Houses (80), Ballochgoy; A. Stephen, burgh surveyor, High Street.

Rowley Regis.—Houses (162), Grace Mary Estate, Tividale; town clerk.

Rugby.—Ward block and laundry, Harborough Magna Isolation Hospital, for the Joint Hospital Board; clerk.

Sanderstead.—Houses (161), Kingswood Estate; Chapple Estates, Ltd.

Scunthorpe.—Ward block, War Memorial Hospital; W. H. Buttrick, architect, 43, Oswald Road.

Sheffield.—Houses (70), Arbourthorne Estate (£22,513); M. J. Gleeson, Ltd. Houses (36), Foxwood Estate; Hallewell Estates, Ltd. Houses (42), Millhouses Lane; Cussins, Ltd. Churches, Wybourn, Woodthorpe, Longley, Arbourthorne Estates; Church of England authorities.

Shrewsbury.—Church, Harlecote Housing Estate (£10,000), with electrical work; H. L. North, architect, Wern Isaf, Llanfairfechan, North Wales

Stalybridge.—Houses, Cambridge Street and Harrison Street; James Ridyard & Sons, Ltd.

Stanmore.—Flats (300), Manor House Estate; A. Anderson.

Stevenage (HERTS).—Cinema; H. W. J. Dutton, Knebworth.

Stockport.—Business stores, Chestergate (£80,000), for the Co-operative Society; W. T. Armstrong, general manager.

Stockton-on-Tees.—Houses near the Blue Hall Estate; G. P. Stainsby, architect, 25, High Street. R.C. church, Darlington Lane; A. Harrison, 69, High Street.

Stoke-on-Trent.—Schools, Abbey Hulton, Meir, Hanley, and Chell, for City E.C.; chief architect.

Sudbury (MIDDLESEX).—Cinema, for the Odeon (Sudbury), Ltd.; A. P. Starkey, architect, 315a, Station Road, Harrow.

Sunderland.—Additions to factory, for Brewers & Co., Sunderland Street; G. E. Matkin, architect.

Surrey.—School (384 places), Malden, for County E.C.; secretary, Kingston-on-Thames.

Sutton Coldfield.—Houses (67), Chester Road, New Oscott; Clayton Farm Estates. Schools, Boldmere; borough engineer.

Torquay.—Extensions, Torbay Hospital, Newton Road; Governors.

Tunbridge Wells.—Civic centre (£157,550); Percy Thomas, 6-7, St. John's Square, Cardiff, and E. Prestwich, Bradshawgate Chambers, Leigh, Lancashire, joint architects.

Tynemouth.—Cinema, Front Street; H. Waller, builder, Back Waller Street, Newcastle-on-Tyne.

Wakefield.—Bank, Westgate; Tennant & Smith, for York County Savings Bank. Baths, Fieldhead, Stanley; city engineer. School, extensions, Lawefield Lane; city architect.

Walsall.—Additions to the Isolation Hospital, Goscote (£10,000), with electrical work; J. Taylor, borough surveyor, Council House.

Warrington.—Houses (40), Winwick Mental Hospital; Richard Owens & Son, architects, 3, Crosshall Street, Liverpool.

Warwickshire.—Infants' school, Lode Lane, Solihull; A. C. Bunch, architect, Shire Hall, Warwick. Extensions to Hams Hall Power Station, Lea Marston, for the Birmingham Electric Supply department, 14, Dale End, 4; Ewen Harper Brother & Co., architects, 191, Corporation Street, Birmingham, 4.

Watford.—Factory, Balmoral Road; C. T. Culpitt. Houses (42), Bradshaw Estate; Industrial Builders, Ltd.

West Hartlepool.—Houses (300), for the Public Trustee; J. H. Garry, architect, 47, Church Street.

Weston-super-Mare.—Church, Station Road; Fry, Paterson & Jones, architects, 28, Waterloo Street.

West Riding.—Infants' school, Hemsworth; H. Wormald, county architect, County Hall, Wakefield. Infants' school, Newall Carr Road, Otley, for C.C.; A. Gregory & Sons, Ltd., builders, Manor Works, Glasshoughton, Castleford. County library, Honley, for C.C.; education officer, County Hall, Wakefield. Schools, Stainforth, Hatfield, and Sprotborough, for County E.C.; director of education, Wakefield.

Whitby.—Houses (31); R.D.C. surveyor.

Whitehaven.—Remodelling public baths (£11,000); borough surveyor.

Worcestershire.—Senior school, Evesham; County architect.

Workington.—Houses (50); borough engineer.

Worthing.—Additions to Steyne Hotel, Steyne Gardens; G. H. Treacher.

Wortley (YORKS).—Houses, Penrith Grove and Portland Road; W. Vincent.